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Osteotomy of condylar neck for correction of prognathism: study of fifty-two cases

■ *Daniel Verne,*D.D.S., Cleveland; Richard Polachek,† D.D.S., University Heights, Ohio, and Donald N. Shapiro,‡ D.D.S., Detroit*

The surgical correction of mandibular prognathism has become, in the last decade, an increasingly favored procedure. This recent favor is due, in large part, to the refinement of operative technics and to the development of antibiotics, both of which have reduced considerably the hazards attendant on this type of cosmetic surgery. The consequent demand on the part of the prognathic patient to avail himself of this elective operation has been a stimulus to devise a simple, brief technic which will meet perfectly the needs of the patient and at the same time subject him to the minimal amount of surgical and psychological trauma.

The *sine qua non* of any operation for mandibular protrusion is the establishment of a pleasing profile and the improvement of masticatory ability. To this end, a variety of approaches has been propounded, each of which has its adherents. Dingman,[1] Thoma,[2] Blair and Ivy,[3] and Cameron and Stetzer[4] have long advocated the bilateral ostectomy, in which wedge-shaped sections are removed from the body of the mandible in the region of the first molars. Moose[5] favors the intraoral approach for sectioning, horizontally, the ascending ramus, whereas Kazanjian[6] recommends an open, slanting osteotomy of the ramus secured by transosseous wiring.

In this study, the authors have evaluated a procedure whereby the ramus is sectioned along a line extending from the most inferior curvature of the sigmoid notch to a point superior to the angle of the mandible. Records were kept and observations made on fifty-two surgical pro-

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†Assistant visiting oral surgeon, Mount Sinai Hospital of Cleveland.

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1. Dingman, R. O. Osteotomy for correction of mandibular malrelation of developmental origin. J. Oral Surg. 2:239 July 1944.

2. Thoma, K. H. Oral surgery, vol. 2, ed. 2. St. Louis, C. V. Mosby Co., 1952, p. 1944-1507.

3. Blair, V. P.; Ivy, R. H., and Brown, J. B. Essentials of oral surgery, ed. 3. St. Louis, C. V. Mosby Co., 1944, p. 470-476.

4. Cameron, J. R., and Stetzer, J. J., Jr. Bilateral resection of mandible to correct prognathism. J. Oral Surg. 6:69 Jan. 1948.

5. Moose, S. M. Correction of abnormal mandibular protrusion by intra-oral operation. J. Oral Surg. 3:304 Oct. 1945.

6. Kazanjian, V. H. Treatment of mandibular prognathism with special reference to edentulous patients. Oral Surg., Oral Med. & Oral Path. 4:680 June 1951.

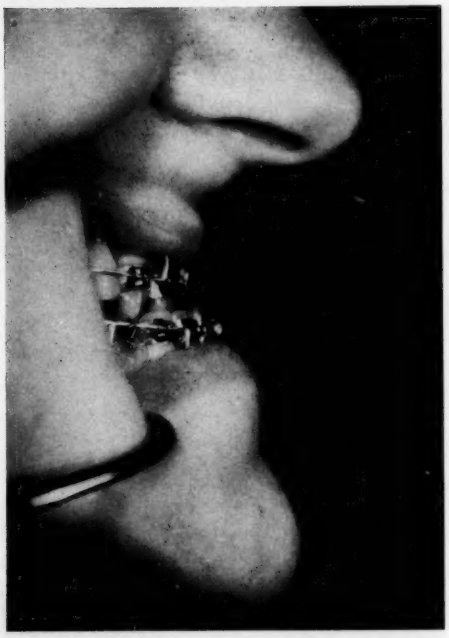

Fig. 1—Preoperative view. Orthodontic bands with sprues attached for intermaxillary fixation

cedures performed during the period from August 1945, to September 1955.

■ *Procedure*

In order to predict the postoperative occlusion, an orthodontic consultation was solicited before surgical intervention. In most instances it was determined, with the aid of study models, that the upper arch would readily accommodate the lower and, consequently, arch expansion was not necessary. When it was observed that severe occlusal interference would be present after repositioning, or when the upper arch would not accommodate the lower, orthodontic correction was carried out prior to the surgical procedure. Minor occlusal disharmony was treated after the mandible had been retruded and union had taken place at the site of osteotomy.

In those patients for whom orthodontic treatment was planned or had been previously carried out, every available tooth was banded securely; a heavy orthodontic bar was formed to fit the upper arch, and another bar molded to conform to the lower arch. Sprues of rounded gold wire were soldered to each arch in a vertical direction and positioned opposite one another (Fig. 1). Generally, there were about ten sprues in each arch, and they were used primarily to secure rubber or wire traction for locking the teeth together after the operation. If the patient did not have an orthodontic appliance placed preoperatively, ordinary arch bars of the type used in fracture cases were utilized and maintained in a fixed position by wiring to the individual teeth.

Two of the 52 patients undergoing surgery were edentulous. In these circumstances, a modified Gunning splint was used for immobilization, and a Barton-type bandage of elastic material was applied to maintain the postoperative relation.

The operation in all instances was identical, and was substantially the same as that used by Kostecka[7] and Schaefer.[8] Premedication was modified to conform with the physiologic requirements of the individual patient. In general, preoperative medication consisted of meperidine 50 mg., pentobarbital sodium or secobarbital sodium 50 mg. and scopolamine hydrobro-

7. Kostecka, F. A contribution to the surgical treatment of open-bite. Internat. J. Orthodont. & Den. Children 20: 1082 Nov. 1934.

8. Schaefer, J. E. Correction of malocclusion by surgical interference. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 27:172 April 1941.

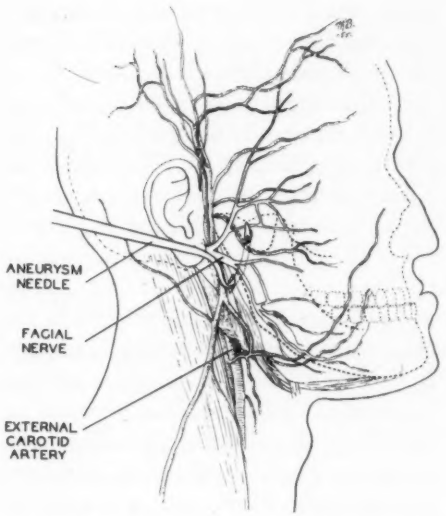

Fig. 2—Passage of aneurysm needle through sigmoid notch. Note proximity to important structures, such as facial nerve and external carotid artery, and necessity of remaining in close contact with bone after introduction of needle

mate 0.4 mg., given by intramuscular injection. Patients in the earlier group, who were operated on before endotracheal intubation became common practice, were anesthetized and maintained with intravenous thiopental sodium 2.5 per cent. Later, all patients were induced with thiopental but maintained with cyclopropane, nitrous oxide, or ether (depending on the physical status of the patient) delivered through a nasotracheal tube.

The face was clean shaven to a point opposite the superior border of the auricle, and the face and neck were washed thoroughly with tincture of green soap and water; benzalkonium chloride was then applied to the prepared area. The patient was draped in the usual fashion, and the operative site left isolated and exposed. A sandbag placed beneath the patient's shoulders often helped to position the side of the face in a more favorable operating angle.

The initial incision, about 1 cm. in length, was made through the skin at the posterior border of the ramus, midway between the angle of the mandible and the lobe of the ear (Fig. 2). A mosquito-type hemostat was used to separate and elevate the skin from the subcutaneous structures in order to prevent puckering and scarring during healing.

A large aneurysm needle was then inserted through this primary incision and contact with the medial surface of the ramus immediately established. From this point on, close approximation was maintained continually with the inner surface of the ramus until the aneurysm needle passed through the sigmoid notch (Fig. 3). (Close contact with bone during the passage of the needle up to the sigmoid notch was imperative, in order to avoid the severing of structures lying medial to the ramus.) Emergence of the blunt end

Fig. 3—Dry specimen showing relation of needle to sigmoid notch

of the needle through the sigmoid notch was evidenced by a slight elevation of skin, and that point became the target for the second skin incision. This incision, like the first, was approximately 1 cm. in length, or adequate to permit the end of the aneurysm needle to emerge through the skin with ease. One end of a stainless steel wire 0.016 in diameter was then threaded through the needle; the other end was attached to a Gigli saw. The Gigli saw, by this arrangement, could then be withdrawn through the primary skin incision.

With the aid of handles attached to each end of the saw, the operator sectioned the bone along this predetermined plane, being certain to protect the edges of the incision from the teeth of the saw. After the bone was sectioned, and the saw withdrawn, the skin was closed with interrupted no. 00000 blue monofilament nylon sutures. The head was then turned and the same surgical procedure carried out on the other side of the face.

After the second ramus was divided through the neck of the condyle, the mandible was ordinarily so mobile that little effort was required to reposition it to a normal relationship with the upper arch (Fig. 4). The mandibular teeth were articulated with the teeth of the maxilla and promptly fixed in this position by the placement of intermaxillary rubber bands. In the few cases which resisted immediate retrusion, 24 hours of elastic traction invariably produced the desired alignment. Immobilization of the mandible completed the operation and the patient was sent to the recovery room.

All patients during their hospital confinement received a high calorie, high protein liquid diet, and oral hygiene was promoted with saline irrigation.

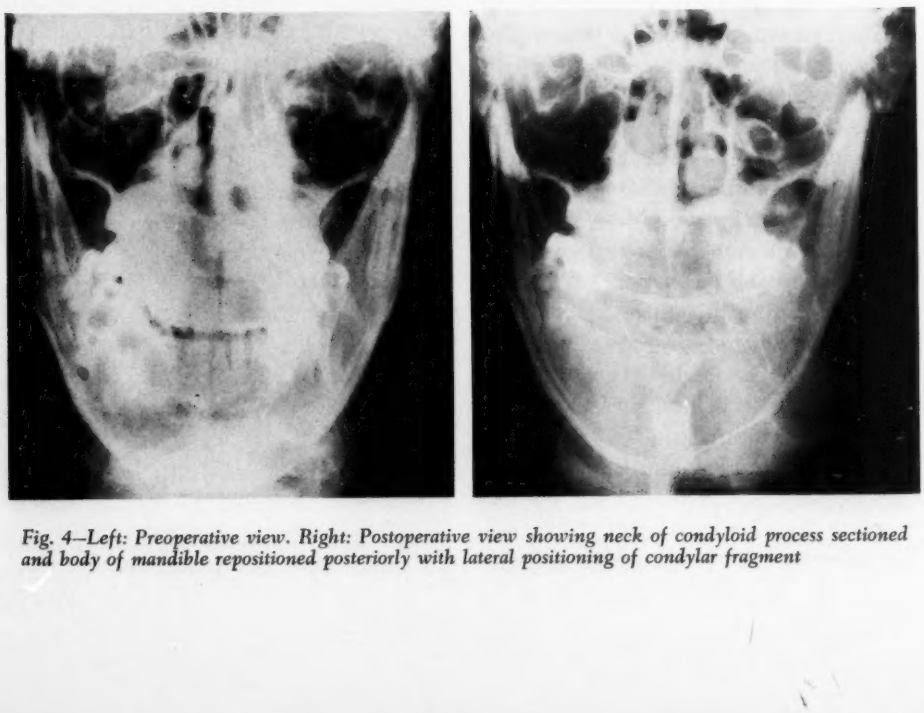

Fig. 4—Left: Preoperative view. Right: Postoperative view showing neck of condyloid process sectioned and body of mandible repositioned posteriorly with lateral positioning of condylar fragment

Intermaxillary fixation was maintained for six to eight weeks. During this period, if elastic immobilization appeared to be inadequate, fixation was augmented by stainless steel orthodontic wire. After immobilization was discontinued, the patient was placed on soft diet until the muscles of mastication returned to their former utility.

■ *Discussion*

As might be expected, women seeking the operation outnumbered the men by over two to one. Slightly over 80 per cent of all the patients studied were unmarried, many of them giving their marital status as the major reason for seeking treatment. It may be presumed that one of the main reasons for inability to contact some of these young unmarried women for purposes of follow-up studies was change in marital status. A significant age group was noted; 46 of the 52 cases were between 20 to 30.

The shortest operating time was 20 minutes and the longest 105 minutes, with the average being approximately 48 minutes. This time was figured from the moment of incision to the placement of the last suture.

The longest period of postoperative hospitalization was nine days, and the shortest, three days. One of the patients with prolonged convalescence was kept because of her age, 54, which was the oldest of any patient in the study, and because of prolonged pain which could only be controlled under close supervision. The average period of hospitalization after surgery was five days. The length of stay in the hospital after the operation can be broken down as follows: One patient, 3 days; 12 patients, 4 days; 22 patients, 5 days; 12 patients, 6 days; 3 patients, 7 days, and 2 patients, 9 days.

The attempt to measure the patient's subjective response to the procedure, specifically in terms of pain experienced, was admittedly an inexact estimation. In any situation so fraught with variables, such as the judgment of the surgeon and the weight, sex, and emotional stability of the patient, the only yardstick available was the amount of narcotics necessary to render the patient comfortable. Because of intermaxillary fixation, these were given intramuscularly in all instances.

Codeine sulfate was used almost exclusively in the earlier cases, whereas after 1948, meperidine hydrochloride was the narcotic of choice. The quantitative range, reflecting the variability of patient response to the same operation, ran from "none" to 1,975 mg. of meperidine. (This latter amount was far greater than in any other instance.) The average patient was kept completely comfortable by a total dose of 3 grains of codeine or 200 mg. of meperidine. In nine instances, or 17.3 per cent of those studied, no analgesics of any kind were required.

The administration of antibiotics was determined by the preference of the operator and by the usage at the time the operation was performed. In the earlier cases, soon after World War II, penicillin was utilized sparingly, if at all. In later years, this antibiotic was used in increasing amounts.

The decision as to whether or not to use an antibiotic was dictated, to a large extent, by two factors: (1) the patient's general health and (2) the susceptibility of the patient to infection, as elicited by a

history. In some instances, the pre-existance of disease, such as chronic myringitis or rheumatic heart disease was an important factor. The small amount of tissue exposure and manipulation incident to the osteotomy reduced the possibility of infection to the minimum, and the average healthy patient was not given penicillin routinely. Over half the subjects (54 per cent) were given no antibiotics at all, and in no instance was any evidence of infection encountered in the convalescent period.

Complications during surgery were four in number. Three patients had excessive hemorrhage; two of them required a transfusion of 500 cc. of whole blood. It was felt that the loss of blood in one of these instances was due to the severing of the internal maxillary artery. Bleeding in this instance was controlled finally by packing with iodoform gauze, and ligation of the external carotid artery was not necessary.

The other complication arose when the Gigli saw broke as it was being used to section the mandible. The fragment, which was stainless steel and sterile, was allowed to remain in the soft tissues medial to the ramus, as it was felt that it was potentially more dangerous to remove it than to allow it to remain. There have been no sequelae to date.

Of the 52 cases investigated, there were 13 in which the recovery period was marred by complications. By far the most common of these was involvement of the facial nerve. In seven instances some paralysis, usually of the mandibular branch of the facial nerve, occurred. Since function invariably returned soon after disappearance of postoperative edema, the authors feel that paralysis in these instances was due to pressure phenomena and was not the result of any direct operative injury to the nerve. In no instance did lack of function persist beyond three months, and in most instances less than ten days; this would not have occurred had the nerve actually been sectioned.

In two instances injury to or pressure on the inferior alveolar nerve resulted in paresthesia of the lower lip. This, too, was temporary and normal sensation gradually returned over a period of several weeks. Otalgia, mild and transitory in nature, made its appearance in one instance. One patient developed a cosmetically alarming, although asymptomatic, infraorbital ecchymosis. Prolonged pain was noted in one instance and prolonged nausea in another. In one instance, the intermaxillary wires were cut on the first postoperative day in order to permit emesis.

Hematoma was not considered a complication. Large hematomas consistently appeared after the surgical procedure because of the small incisions and the resultant engorgement of blood. Resorption always took place in 7 to 14 days.

■ *Results*

Patients, whenever possible, were evaluated by direct examination. During the ten year period encompassed by this investigation, many of the patients had moved to other parts of the country or could not be located. In these instances, comprehensive questionnaires were sent out, and the assistance of the patient's dentist was solicited. Either by examination or query, 26 follow-up evaluations,

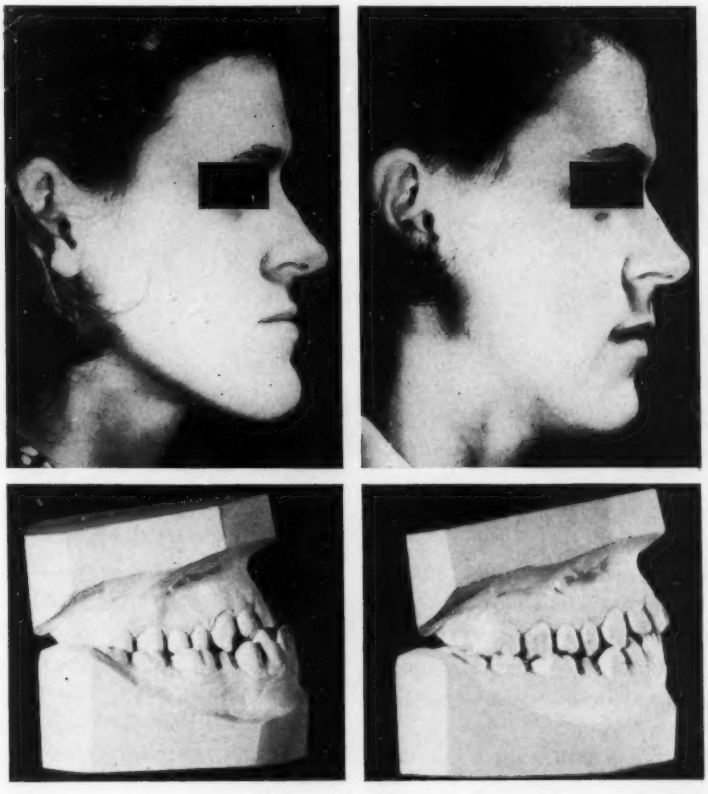

Fig. 5—Above left: Preoperative view of patient. Above right: Postoperative view. Below left: Preoperative cast of patient. Below right: Postoperative cast

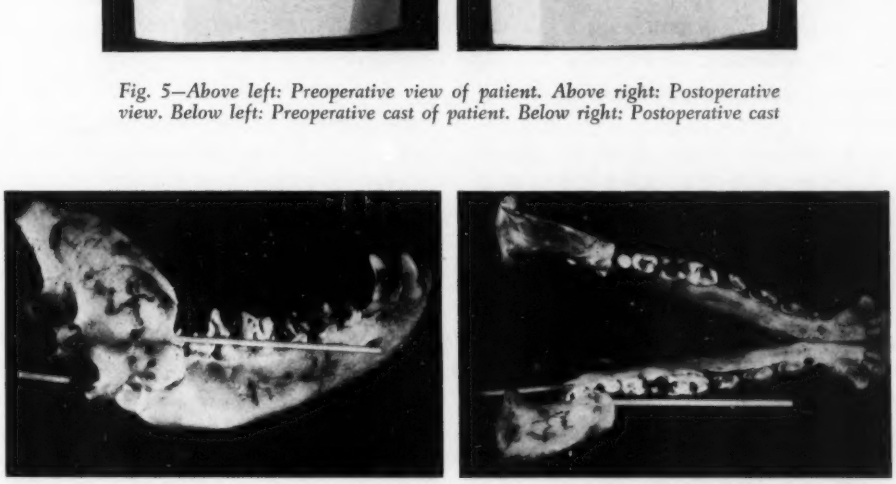

Fig. 6—Left: Lateral view of mandible of dog on which osteotomy had been performed three months previously. Rods have been placed to designate inferosuperior limits of overlapping union. Right: Superior view of same mandible showing mediolateral and anteroposterior limits of union

Table
Evaluation of surgical procedure by 26 patients

Question	Answer	
	Yes	No
General satisfaction with result	26	0
Objective cosmetic improvement	26	0
Improved masticatory function*	24	0
Open bite*	0	24
Pain or discomfort after discharge from hospital	0	26
Paresthesia	3	23
Paralysis	0	26
Other complications	2	24

*Two patients were edentulous.

spanning the entire ten years, were collected.

The questions serving as criteria in judging the success or failure of the procedure were as follows:

1. Was the patient generally satisfied with the results?
2. Were his friends and family pleased with the cosmetic change?
3. Could he chew his food better after the operation?
4. Had there been an opening of the bite since surgery?
5. Did the patient experience any pain or discomfort attributable to the operation since his discharge from the hospital?
6. Was he aware of any numbness or paralysis of his face since the time of surgery?
7. Had there been any other complications from the operation?

The table shows the response to these inquiries.

The most common persistent complication involved paresthesia of the lip, either upper or lower, or the cheek. None of these three patients reported paresthesia immediately after surgery, but it is felt that this was due to oversight rather than to delay of onset. In one of the three patients, operated on in March 1952, sensation was gradually returning; in another patient in whom paresthesia involved the cheek, the condition has persisted since 1949 with no improvement; whereas in the third, with an involvement of the lower lip, paresthesia has been present only since January 1954, the date of operation. No discomfort, paralysis or open bites were encountered in the patients contacted. All patients responding expressed satisfaction with the result and maintained that they were able to masticate more efficiently after the procedure (Fig. 5).

Two complications which could not be predicted in the immediate postoperative period were reported. One patient perspired regularly on the right side of the face while eating. This patient had experienced severe hemorrhage on this side during the operation, and the authors can only surmise that some derangement of the sympathetic plexus surrounding one or more of the branches of the external carotid artery occurred, with disruption of normal function of the sweat glands of the region involved. The other patient complained of a twitch on the right side of her face whenever the right eye was closed. Presumably, this phenomenon re-

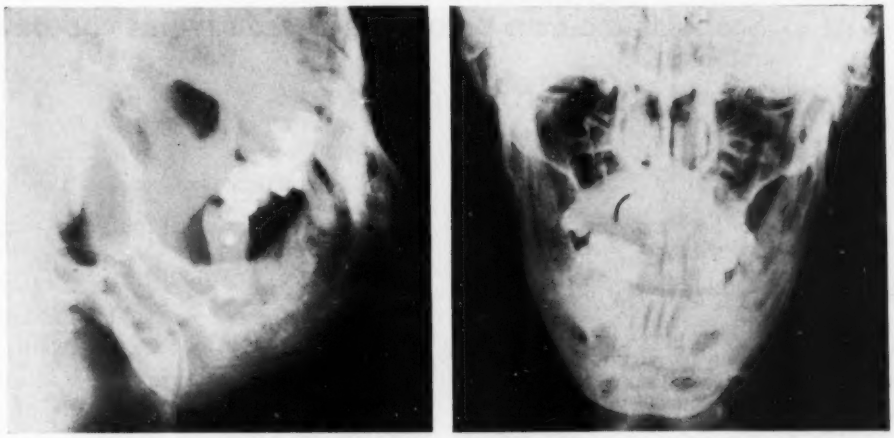

Fig. 7—Roentgenograms taken nine years postoperatively. Note high degree of radiopacity and evidence of complete ossification in region of neck of condyloid process

sulted from aberrant regeneration of damaged facial nerve fibers, with the production of associated movements. Unfortunately, this patient had moved to a distant part of the country and so could not be examined clinically.

■ *Experimental and Roentgenographic Studies*

The statement has been made that "the attachment of one cortex to another is never as good as bony consolidation occurring at fractured or cut surfaces."[9] To determine the union that occurs in the procedure described previously, bilateral osteotomy was performed on four dogs, with resultant overriding of the cortical plates. Intermaxillary fixation was achieved by the use of thimble crowns and maintained for an eight week period. At the end of three months the animals were sacrificed and examined. In each instance the union occurring at the location of the overriding surfaces was well calcified and firmly resistant to stress (Fig. 6).

Roentgenograms of the patient taken nine years postoperatively reveal, typically, complete ossification of the sectioned condylar neck (Fig. 7).[10]

■ *Conclusion*

Fifty-two cases of osteotomy of the neck of the condyloid process for the correction of prognathism have been investigated. Twenty-six of these have been studied after a period of from one to ten years. It is believed, on the basis of these results, that the method described provides an effective, uncomplicated and relatively atraumatic procedure for correcting the protrusive mandible.

9. Thoma, K. H. Oral surgery, vol. 2, ed. 2. St. Louis, C. V. Mosby Co., 1952, p. 1494.

10. Reiter, Edward. Surgical correction of mandibular prognathism. Alpha Omegan 45:104 Sept. 1951.

Scopolamine as a preoperative sedative in children

■ *Albert A. Antoni,* D.D.S., Toronto, Ontario, Canada, and Fred A. Henny,† D.D.S., Detroit*

The extraction of hopelessly carious or infected deciduous teeth and first permanent molars for children who are between 3 and 10 years of age is usually a difficult procedure under local anesthesia. Most children are incapable of cooperating sufficiently, or are terrified at the prospect of having such operations performed. General anesthesia alone is not the answer to this problem, since usually it is a struggle for the nurse to separate the child from the parent, and the anesthetic induction frequently is stormy and difficult, with excessive salivary and bronchial secretions handicapping both the anesthetist and the surgeon.

A medication to ease apprehension, to make the patient less aware of what is going on about him, to reduce salivary and mucous secretions, and to make the administration of the anesthetic smoother and easier is almost universally indicated. Various drugs, including atropine sulfate, methantheline bromide, and scopolamine have been employed by us as preoperative medications. Of these, scopolamine has been found far superior to the others.

It is known that pharmacologically atropine sulfate[1,2] depresses the secretory nerve endings, which thereby reduces mucous and salivary secretions. Atropine also stimulates the cerebral and vital medullary centers, unless given in extremely large doses. As a result, it depresses the vagus nerve endings, freeing the heart from the usual inhibitory vagus control and increasing the heart rate.

There is little effect on sensory nerve endings, so that atropine sulfate has little effect on pain and apprehension. Methantheline bromide[3] successfully dries up oral secretions, but has no sedative or amnesic effect. Like atropine, it produces cardioacceleration but does not seem to have any pharmacologic effect on the central nervous system. Its best attribute is that it reduces gastric and bowel motility and reduces oral secretions. Scopolamine,[1,2] however, produces a short period of cerebral stimulation which is followed by a prolonged, mild depression of the psychic and motor centers. It has a peculiar amnesic action[2] which may even abolish memory of events that occurred during induction. It is known to lessen restlessness and excessive motor activity, and its depressing effect on secretory nerve endings surpasses that of atropine.

■ *Method of Administration*

Since children object to hypodermic injections, it has been felt that scopolamine would serve the required purpose

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†Chief, division of oral surgery, Henry Ford Hospital.

1. Howard, M. E. Modern drug encyclopedia, ed. 4. New York, Drug Publications, Inc., 1949, p. 80, 81; 416, 417.

2. Goodman, L. S., and Gilman, G. Pharmacological basis of therapeutics, ed. 2. New York, Macmillan Co., 1955, p. 47, 48; 463-468.

3. Armer, A. L. Methantheline bromide as a premedication for oral surgery. J. Oral Surg. 11:22 Jan. 1953.

best if it were administered orally. To arrive at a basis for oral dosage, one of us, (A.A.), experimented by taking the drug himself in tablet form on several occasions over a period of a week. From this it was concluded that the accepted oral dose was double that of the hypodermic dose. The following table was drawn up, taking into consideration the recognized usual injected dose, the patient's age and weight:

Age	*Weight*	*Scopolamine (oral)*
2-3 yrs.	27-35 lbs.	1/300 grains
4-6 yrs.	35-45 lbs.	1/200 grains
6-10 yrs.	45-65 lbs.	1/150 grains

■ *Effects*

Data were recorded on 100 patients who had been given the drug one half to three quarters of an hour prior to being anesthetized with divinyl ether. The operations performed included extraction of teeth, release of labial and lingual frenums, probing of parotid and submaxillary ducts, and repair of lip and tongue lacerations. In every instance, it was noted that the patients appeared as if they were under the influence of a light narcotic. Most children walked into the operating room willingly, and the anesthetic induction was extremely simplified. The amount of anesthetic agent required to induce anesthesia was lessened, and the recovery period was not lengthened. All secretions were greatly depressed, thus simplifying the anesthetist's problem and making the surgery itself simpler. Transient nausea and vomiting occurred in 5 per cent of the patients.

No deleterious effects of any importance were noted. Ten patients developed a typical scopolamine rash, and 52 exhibited a slight dilatation of the pupils. In no instance did these two conditions persist longer than four hours. The patients were held for an average of ten minutes in the recovery room, and no parent reported any ill effects after the child was taken home. Most parents reported that their child slept quietly for approximately two hours upon their return home, and very few complained of postoperative discomfort.

■ *Summary*

1. General anesthesia is indicated when minor oral surgery must be performed on children between the ages of three and ten.

2. Some type of premedication facilitates the anesthesia and surgery.

3. Scopolamine given orally satisfies all requirements.

4. Tablets of 1/150 and 1/200 grain are the only size that need to be kept in stock.

5. For a child two to three years of age, a 1/150 grain tablet is cut in half with a sharp instrument. For a child between four and six years of age, a 1/200 grain tablet is given; and for a child between six and ten years old, a 1/150 grain tablet is used.

6. The parent can be instructed to give the drug to the child a half hour prior to the appointment, or it can be administered when the patient comes for the surgical procedure.

7. All patients should receive a routine preanesthetic physical examination. They should abstain from food for at least five hours prior to surgery, and they should be encouraged to empty the

bladder just before going into the operating room.

■ *Conclusions*

Scopolamine given orally is a satisfactory drug for preanesthetic management of child patients. Its use in general dentistry and in pedodontics has yet to be proved, but it appears from the results obtained in this study that it would be of great benefit. No deleterious effects of any importance were noted.

Distribution of oxygen and nitrous oxide from a central source in oral surgery offices

■ *William E. Doering, Chicago*

The growing recognition within the dental profession of the value and convenience of distributing oxygen and nitrous oxide from a central source is leading to a steadily increasing number of such installations. Even though distribution of oxygen and nitrous oxide from a central source is relatively new to the dental field, in the Pittsburgh area alone, for example, three dental suites have already been so equipped.

Piping of oxygen and nitrous oxide from a central supply offers to oral surgeons certain definite advantages over the use of single cylinders of gas within operating rooms. The major advantage is that gas cylinders no longer need be present in the operating rooms. Instead, they are placed in any small, convenient room from which the gases are piped to points of use. Moving the cylinders away from the operating areas releases valuable space where it is particularly needed and eliminates the possible confusion of working around large cylinders.

Fire hazard also is reduced by distribution of gas from a central source. Gas cylinders are segregated and gases entering the operating room at low pressure may be turned off in emergencies by room shut-off valves. These valves are located in the gas lines near, but not in, the operating room.

Piping of oxygen and nitrous oxide from a central supply eliminates the possibility of a cylinder's accidentally falling over or being knocked over when in use. In this way it lessens the possibility of injury to personnel and damage to property that may result from accident or careless handling of cylinders, and reduces to a minimum the handling of the heavy cylinders by inexperienced personnel.

Engineering department, medical division, National Cylinder Gas Company.

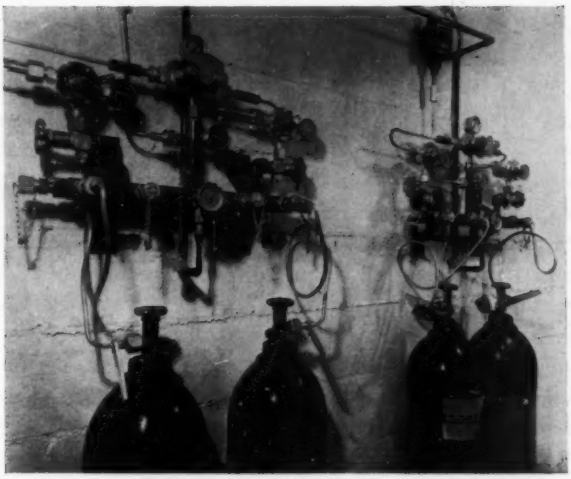

Fig. 1—Small central gas system uses one cylinder on service bank and one on reserve for oxygen and nitrous oxide each. Manifold arrangement has pressure regulator on each bank, twin regulator to provide automatic switching and pressure switch to operate alarm

Distribution of gases from a central source leads also to added convenience. It provides either oxygen or nitrous oxide instantaneously—when it is needed. With such a system it is no longer necessary to change cylinders and regulators, possibly during an operation. Instead, all that must be done is to throw a switch to reset the manifold once cylinders are changed. The reserve bank is insurance against running out of gas at an inopportune time.

■ *Gas Distribution Systems*

Oxygen and nitrous oxide systems are similar as they both consist of four principal parts: manifold, piping, zoning valves, and outlets.

The manifold includes a supply header and the required valves, gauges and regulators. The manifold, generally made of brass or bronze, has the supply header divided into two sections, each connected to one or more cylinders. One bank of cylinders is the supply, the other the reserve.

Banks for oral surgery offices (Fig. 1) may consist of one, two, or three cylinders each. The cylinders are connected to the manifold by high-pressure copper "pigtails," or cylinder leads. A check valve between cylinder and manifold protects the system against a back flow of gas from the entire assembly if one cylinder proves defective.

Both sections of the manifold header are connected, but separately, to the distribution piping through high-pressure shut-off valves and pressure regulators. Manifolding is arranged so either bank

can feed through either regulator to allow removal of a regulator for servicing without shutting down the system.

Pressure regulators reduce both the oxygen pressure from the cylinder pressure of 2,000 pounds per square inch and the nitrous oxide pressure from its cylinder pressure of 750 pounds per square inch to about 50 pounds per square inch. They also switch gas supply from the bank in use to the bank in reserve when the pressure of the gas of the "in-use," or service, bank falls to a predetermined point. The regulator on the service side is set at approximately 50 pounds per square inch; that on the reserve side at approximately 40 pounds per square inch. The reserve bank then takes over when the pressure in the distribution line falls to the reserve-side pressure setting.

When the switch is made from the service bank to the reserve bank, an alarm system signals that the first bank has been exhausted and should be replaced. The usual type of alarm is an electric pressure switch system that is energerized by reduced manifold pressure. It is set to operate at slightly above the pressure at which the regulator on the reserve bank puts this bank on the line. The alarm, consisting of a light and a buzzer, may be placed in one operating room, or an alarm for each gas may be placed in all rooms so the anesthetist is warned, whichever room is in use. A toggle switch shuts off the buzzer and operates a reset relay.

Once the reserve bank has cut in, exhausted cylinders should be replaced. Throwing a lever then causes the full cylinders to become the new reserve bank, ready to take over when the other becomes exhausted. Thus, a continuous supply of gas is guaranteed—with no service interruptions or hauling of cylinders to the operating room.

Distribution piping is made of seamless copper tubing of either type K or type B; either meets the strength and workability requirements for such installations at a reasonable cost. Pipelines are concealed within ceilings, floors and walls in new buildings, but are usually surface-mounted in existing buildings. Hard-temper tubing is generally selected for exposed installations, as it can withstand accidental bumps. Soft-temper tubing is satisfactory for installations that are concealed.

Pipeline fittings are wrought or cast copper, brass, or bronze. Joints, except for those at valves or equipment requiring screw connections, are made with silver solder or a similar brazing material of high melting point. Piping runs should be supported at intervals of not more than 10 feet with suitable hangers or clamps.

Emergency shut-off, or zoning, valves should be located outside of each operating room or location for administration of anesthesia. The valve box assembly is mounted on the corridor wall at a recommended height of 5½ feet above the floor to the center of the valve. If necessary, both oxygen and nitrous oxide supplied to the operating room can be shut off immediately.

At the point of use, single terminal service outlets are available for oxygen or nitrous oxide service. Double outlets can be installed where the two are desired in combination, and even triple outlets where one other service—vacuum or compressed air—is combined with the other two. Outlets should be installed in all operating

rooms, and oxygen in particular should be available in recovery rooms.

Outlets may be installed in either wall or ceiling. Recommended height for wall outlets is approximately 5 feet above the floor (Fig. 2, left). Ceiling outlets are desired by some since their use eliminates any danger to personnel from becoming entangled in hose assemblies on the floor (Fig. 2, right). Also, ceiling outlets may require less hose than would be needed to run from wall outlets to anesthesia machine. If the outlet is supplied with 6 feet or more of pipe terminating in a noninterchangeable quick-coupler, no shut-off valve outside the operating room is required by the National Fire Protection Association. The long tubing gives fire protection by a quick-break attachment at the machine.

■ *Typical Piped Dental Suite*

A typical installation in a dental suite is shown in the accompanying sketch (Fig. 3). This particular suite has three operating rooms (all supplied with oxygen and nitrous oxide services), three recovery rooms and a small room at one end for gas cylinders and manifolds. From the oxygen and nitrous oxide manifolds, pipelines run along the hallway ceiling, drop to shut-off valves outside each operating room, return to the ceiling, and then continue to wall outlets in the operating rooms. Alarms—a green light for oxygen and blue light for nitrous oxide—are

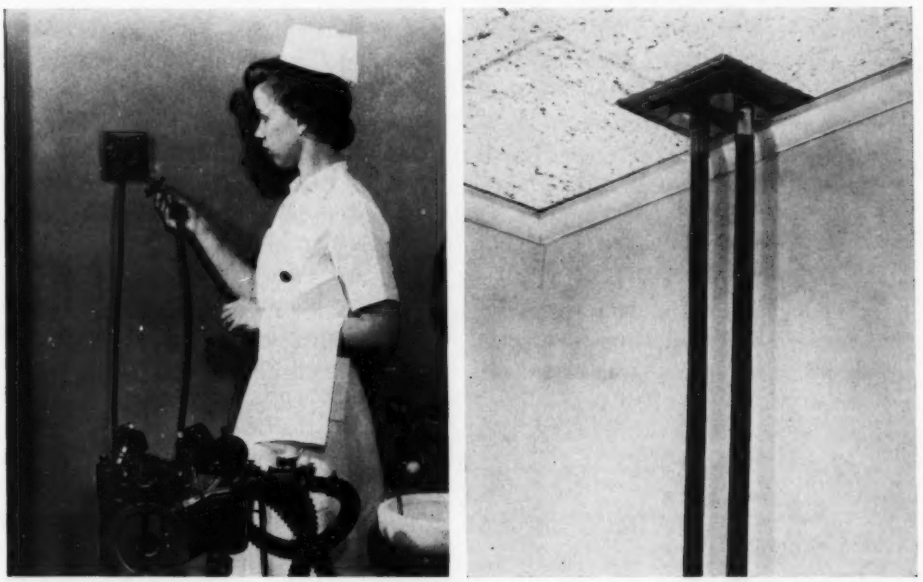

Fig. 2—Left: Wall gas outlets usually are placed approximately 5 feet above the floor. Insertion of hose adapter in outlet is easy one-hand operation. Right: This piped gas system uses ceiling outlet from which hoses lead to anesthesia machine. Ceiling outlet avoids danger to personnel from tripping over hoses strung along floor

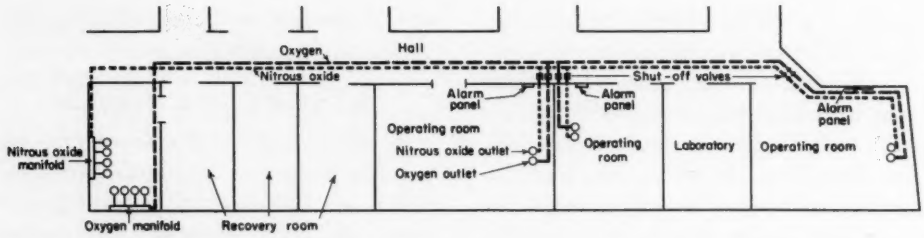

Fig. 3—Layout of typical piped dental suite shows how oxygen and nitrous oxide are piped from end room to three operating rooms. Shut-off valves outside each room reduce fire hazard. In this new suite all piping is hidden—in ceilings and walls—with gas outlets at desired location

mounted on adjacent walls of each room.

Both manifolds have four cylinders —two on service and two on reserve. On each bank, a pressure compensating regulator (a type of single-stage regulator that gives a uniform gas flow) is set for the pressure desired, and a twin regulator provides automatic switching as the line pressure from the service bank falls. An additional unit, which is actually a low-pressure switch, is attached to the manifold downstream of the twin regulator to operate the alarm when pressure falls and the reserve bank of cylinders is thrown on the line.

■ *Vacuum and Compressed Air*

Although in this installation only the piped oxygen and nitrous oxide systems are shown, vacuum and compressed air services can also be tied into a centralized distribution system. A centralized vacuum system eliminates the need for individual suction pumps often used by oral surgeons.

Vacuum and compressed-air systems consist of vacuum pump or compressor, pipelines, and terminal outlets. Vacuum pumps can be obtained as packaged units that automatically maintain the desired vacuum. They are available in a range of sizes to accommodate any installation requirements. Compressors also are available as packaged units in various sizes. They deliver oil-free air, which is essential if the air is to be used for therapeutic purposes. Almost all future installations in dental suites, it is safe to assume, will include vacuum and compressed-air services together with the oxygen and nitrous oxide.

■ Censorship

Don't think that you are going to conceal faults by concealing evidence that they ever existed. Don't be afraid to go in your library and read every book, as long as that document does not offend your own ideas of decency. That should be the only censorship.—*Dwight D. Eisenhower. Speech, Dartmouth College Commencement Exercises, 1953.*

Clinical evaluation of chlorpromazine in general anesthesia for minor oral surgery

■ *Odus L. Baldridge, D.D.S., M.S., Flint, Mich.*

Some of the many properties ascribed to chlorpromazine have potential application to clinical anesthesia. Various reports indicate that this drug can produce sedation without respiratory depression,[1] alleviate nausea and vomiting,[2,3] potentiate the effects of anesthetics, hypnotics and narcotics,[4] create adrenergic blockade with concomitant vasodilatation and reversal of the action of epinephrine,[5] and be used to create tranquility in a patient preoperatively.[6] It is apparent that some of these attributes of chlorpromazine could be useful in the management of patients during anesthesia for oral surgical procedures, provided such other of its effects as hypotension and vasopressor blockade would not be seriously contraindicated.

The place of chlorpromazine in psychiatric practice and in the treatment of nausea and vomiting seems fairly well established. Its value in clinical anesthesia, however, still is not well defined and was the incentive for this study of the application of chlorpromazine to anesthesia of minimum duration. Although the observations reported here provide no reason for advocating the routine use of this agent, they indicate some of the effects that may be expected with the use of this drug during general anesthesia in the oral surgery office. They also indicate that this type of anesthesia can be well managed in patients who receive chlorpromazine preoperatively.

Laborit[7] pioneered the use of chlorpromazine in France as an ingredient of his "lytic cocktail," used primarily for "artificial hibernation." His cocktail was used in preparing "an old man in a run-down condition who is to undergo major surgery" and consisted of promethazine hydrochloride (Phenergan), 50 mg.; Doloral, 100 mg., and chlorpromazine, 50 mg. This was given one hour before surgery cooling began.

From France this technic found its way to the rest of the Continent, Great Britain and eventually to the United States where hypothermic technics offered the surgeon an opportunity to work about the heart and great vessels for longer

Paper read before the Great Lakes Society of Oral Surgeons, Indianapolis, April 27, 1956.

Formerly, resident in oral surgery, Henry Ford Hospital, Detroit.

1. Lehmann, H. E., and Hanrahan, G. E. Chlorpromazine: new inhibiting agent for psychomotor excitement and manic states. A.M.A. Arch. Neurol. & Psychiat. 71:227 Feb. 1954.

2. Morris, G.; Mathews, W., and Moyer, J. Clinical experience with chlorpromazine in spinal anesthesia. Anesth. & Analg. 33:340 Sept.-Oct. 1954.

3. Albert, S. N., and Coakley, C. S. The use of chlorpromazine to control postanesthetic vomiting. Anesth. & Analg. 33:285 July-Aug. 1954.

4. Dundee, J. W. Review of chlorpromazine hydrochloride. Brit. J. Anesth. 26:358 Sept. 1954.

5. Churchill-Davidson, H. C. Hypothermia: a review of the present position. Post-Grad. M. J. 30:346 Aug. 1954.

6. Vandewater, S. L., and Gordon, R. A. Largactil in anesthesia. Canad. Anaes. Soc. J. 2:23, 1955.

7. Laborit, H. De la neuroplegie a l'hibernation artificielle. (Neuroplegia in artificial hibernation.) Gaz. Med. de France 59:1423, 1952.

periods of time than had been possible in the past with standard methods.

Slowly a voluminous literature on chlorpromazine began to appear in this country. The drug was found useful in combating nausea and vomiting of diverse origins.[8,9] Some reported on its value in potentiating narcotics in the palliative treatment of malignant disease. Chlorpromazine found widespread use in the field of psychiatry, it aided alcoholics in their separation from the habit, and, last, it found its way slowly into the general field of anesthesia other than hypothermia.[10] Here the many actions of this compound came under scrutiny of numerous investigators. Young and Kingsbury,[11] first reported on the possibilities of this drug in the field of oral surgery.

Because of the ability of chlorpromazine to promote tranquility, reduce nausea and vomiting and potentiate many other drugs, some commonly used in anesthesia, it was decided to attempt a clinical evaluation of chlorpromazine in anesthesia for oral surgical procedures.

Chlorpromazine is a compound synthesized by the Rhône-Poulenc Laboratories of France in 1950. It is one of a series of synthetic compounds derived from phenothiazine. The substance is a white, odorless powder, freely soluble in water, chloroform and alcohol, but insoluble in ether. It is compatible with d-tubocurarine and succinylcholine.

■ *Pharmacologic Action*

Although much has been written on the action and the use of chlorpromazine, particularly in the French literature, it is still not clear just where and how the drug acts. The pharmacologic knowledge of the drug is still highly theoretical and is based on observations of clinical effects. The action appears to be mainly one of depression, particularly of the central autonomic nervous system.

CENTRAL EFFECTS—Chlorpromazine has a blocking effect on the activity of the autonomic ganglia of the hypothalamus. It is thought that by this hypothalamus blockade the appreciation of pain is dampened, as the pain response is transmitted along this route on the way to the cerebral cortex. The body's awareness of its environment is through proprioceptive reflexes which also pass through the hypothalamus, and the dampening of these reflexes might account for the state of indifference to the environment that is noted in conscious patients given chlorpromazine, rather than a direct cortical depression.

There is a reduced response to central nervous system stimulants such as nikethamide, caffeine and amphetamine. Chlorpromazine has been reported as an effective antiemetic against apomorphine. Finally there is a potentiation of the action of hypnotics, analgesics and general anesthetics.

PERIPHERAL EFFECTS — Chlorpromazine is said to block the autonomic ganglia and also to be vagolytic. This blocking

8. Lipton, Barbara, and Hershey, S. G. Chlorpromazine as an adjunct to spinal anesthesia. New York State J. Med. 55:2463 Sept. 1955.

9. Boulton, T. B. Oral chlorpromazine hydrochloride; a clinical trial in thoracic surgery. Anesthesia 10:233 July 1955.

10. Lear, E.; Chiron, A. E., and Pallin, I. M. Chlorpromazine: an adjunct to premedication; clinical report based on 1,100 cases. New York State J. Med. 55:1853 July 1, 1955.

11. Young, H. E., and Kingsbury, B. C., Jr. Chlorpromazine hydrochloride as an antinauseant and tranquilizing agent —a preliminary report. J. Oral Surg. 4:212 July 1956.

action results in peripheral vasodilatation and postural hypotension, tachycardia and reduction of the autonomic vasopressor reflexes and loss of sweating. Chlorpromazine reduces or reverses the hypertensive effect of epinephrine as does Dibenamine, but the effect of norepinephrine is not changed.

From the previous discussion, it appears that chlorpromazine could have a definite place in clinical anesthesia in sedation, potentiation of general anesthetics and reduction of postoperative emesis. Preoperative sedation with 25 mg. of chlorpromazine without hypnotics or analgesic produces a tranquil, quiet, cooperative patient, frequently asleep, but not depressed. The induction of general anesthesia is smooth and rapid, with no excitement and little or no coughing. Similarly, chlorpromazine may be used in the postoperative period for a sedative substitution in reducing pain and discomfort, with little depression, unless combined with the usual dosage of analgesics or narcotics.

It is generally agreed that chlorpromazine potentiates general anesthetics, both intravenous and inhalation. This potentiation occurs when chlorpromazine is used as a preoperative sedative and particularly so when given during anesthesia. This effect is of some importance in the case of elderly patients and those who are poor risks. These patients can be maintained in a light plane of anesthesia with less of the depressant agents.

■ *Clinical Study*

Chlorpromazine has been used in a series which includes 155 instances of minor oral surgical procedures, mainly removal of impacted teeth and multiple extractions of permanent or deciduous teeth. The series has been divided into two age groups: Group 1 included those up to and including the thirteenth year; Group 2, all over 13. The first and younger group consisted of 55 patients, 25 of whom were controls, and they had an age range from 3 to 13 years. The average age was 5.2 years. The second and older age series consisted of 100 patients, 50 of whom were controls. Their age range was from 14 to 68 years. The average age was 37.5 years.

Chlorpromazine (Thorazine) was used in the following two ways:

1. Premedication for Group 1 was 10 mg. orally 30 to 45 minutes preoperatively.

2. Premedication for Group 2 was 25 mg. single doses intramuscularly, 30 to 45 minutes preoperatively.

Additional premedication for Group 1 was oral scopolamine 0.3 mg., 30 to 45 minutes preoperatively. Anesthesia for Group 1 consisted of nitrous oxide, oxygen and trichloroethylene.

Group 2 received atropine 0.4 mg. intravenously immediately before the surgical procedure. The patients were then inducted with 2.5 per cent thiopental sodium and maintained on nitrous oxide, oxygen and trichloroethylene.

All the anesthesia was given by the writer; the surgical procedure was divided between three of the staff members at the hospital.

■ *Observations*

The observations on the effects of chlorpromazine made in this study have been varied and only on certain points

Table 1

Ease of induction Group 1

Series	No. of cases	Classification of induction		
		Good	Fair	Poor
Control	25	14	8	3
Chlorpromazine	30	27	2	1

agree with those of other observers. It must be admitted that it is easy to become overenthusiastic, and that clinical observations are likely to be exaggerated in favor of the drug.

SEDATIVE EFFECT — Chlorpromazine produces a tranquil state, or a state of indifference. Some patients, particularly women, who are known to be nervous and excitable, come to the operating room quiet, but will respond to questioning and are cooperative. They take no notice of the surroundings and do not object to venipuncture. They are depressed but not in the same sense as with morphine and barbiturates. There is no comparable respiratory depression, particularly in the elderly.

Sedation with chlorpromazine resembles normal sleep in many respects. Patients can be easily awakened to answer questions and yet drop off to sleep again once they are left undisturbed. Of even greater importance is the mental effect of the drug which is observed with subnarcotic doses. This effect is characterized by a loss of apprehension and awareness of the surroundings and is especially noticeable in children. An interesting observation in children who have received chlorpromazine is the fact that these patients will accept the anesthesia mask more readily and clinically appear to undergo little or no excitement state. There is a noticeable reduction in breath-holding during nitrous oxide-trichloroethylene inductions. The ease of induction in Group 1 is attested by Table 1.

CARDIOVASCULAR EFFECTS—The two most common effects noted and reported by other observers are that of tachycardia and hypotension. All the undesirable sequela attributed to this drug and reported in the literature have arisen from much higher dosages than were used in this series and particularly so from those patients that have been on high dosages (100 mg. per day) and maintained over a considerable period (one to three weeks). A mild tachycardia was noticed in children, but this is extremely hard to evaluate because of the normal increased heart rate of the young. This insofar as could be ascertained did not present a problem in the children. Tachycardia did not manifest itself in the adult series.

Stephen and co-workers[12] reported that chlorpromazine, because of its adrenolytic action, tended to prevent the severe cardiac arrhythmia associated with trichloroethylene-epinephrine combinations. Hence with a combined local and general anesthetic the patient can be carried in lighter planes.

12. Stephen, C. R.; Bourgeois-Gavardin, M., and Martin, R. C. Preoperative, peroperative, and postoperative sedation with reserpine. Ann. New York Acad. Sc. 61:236 April 15, 1955.

Table 2
Blood pressure changes after premedication in control and chlorpromazine series
Group 2

Series	No. of cases	No. of patients with post-operative rise in systolic pressure in mm.	No. of patients with post-operative drop in systolic pressure in mm.	Mean systolic rise in mm.	Mean systolic drop in mm.
Control	50	15	35	+ 9	−11.3
Chlorpromazine	50	18	32	+11	−11

It has been established by many authors that patients under chlorpromazine are extremely sensitive to postural changes, much the same as patients under spinal anesthesia. In Group 2 of this series the blood pressure was taken 30 to 40 minutes preoperatively and before the administration of the chlorpromazine and recorded. It was taken again just before the induction and followed throughout the procedure. The pressure at the end of the operation was taken and another reading recorded a half hour later. The results of systolic pressures preoperatively and postoperatively were subjected to a statistical significance evaluation and compared against the control group. The results are given in Table 2.

The chi square test was applied to the mean systolic pressure changes of both groups. Chlorpromazine could have caused the observed difference in blood pressure less than 50 times in 100. Clearly the change observed was due to chance or other factors. The assumed null hypothesis has been upheld.

The observed difference in mean blood pressure between those patients treated with chlorpromazine and those not treated is not statistically significant and could be due to chance or other factors. The assumption that chlorpromazine does not cause significant blood pressure change on single dose application has been upheld.

The systolic pressures of Group 2 taken a half hour after completion of the operative procedure were essentially the same as the pressure recorded immediately after the surgical procedure and were statistically insignificant.

There were no pressure studies recorded on Group 1 for two reasons:

1. Mechanical difficulties are encountered in taking readings on small children.
2. In other studies reviewed in the literature it is reported that hypotensive effects of chlorpromazine have not been observed in children as in adults. Only in hypertensive children (denoting active pathologic conditions) does the blood pressure seem to be affected by chlorpromazine.

Some degree of postural hypotension was avoided in this series inasmuch as all the patients were operated on in a supine position on an operating table. The effects of this drug on a patient sitting in a dental chair undergoing general anesthesia are as yet to be studied.

It was noticed that the general appearance of the patient who has been given chlorpromazine may be mistaken for the hypotension of true shock, and a differentiation must be made. The typical pattern of clinical shock reveals a patient of ashen hue and labored respirations,

a cold and perspiring skin with collapsed veins, a weak and thready pulse, cyanotic nail beds and a falling blood pressure. Patients given chlorpromazine are warm, dry, and frequently asleep with a slow, regular respiratory pattern. Nail beds are pink. The pulse is never thready and only rarely rapid, and the peripheral veins are not collapsed.

In the adult series of patients who received chlorpromazine, there was only one hypotensive complication. This occurred in a 67 year old colored man who was undergoing full mouth extractions. The duration of anesthesia was 70 minutes, during which time he received 1 Gm. of thiopental sodium. His preoperative blood pressure was 158/90 and after induction it fell to 120/80 and remained stable throughout the course of the anesthetic. Shortly thereafter it began a gradual decline until it had reached 70/40 within 20 minutes. An ampule of methoxamine hydrochloride (Vasoxyl) was given at this time intravenously, and within five minutes the pressure was back up to 110/80. An hour later it had reached its preoperative level and remained stable. This blood pressure change might be attributed to the chlorpromazine; however, the blood pressure change is not outside the realms of a normal response when the age of the patient, the nature of the anesthetic agents and the duration of anesthesia is considered.

Because of the adrenergic blockade created by chlorpromazine and its reversal of the action of epinephrine, the literature is conflicting in its reports as to the effects of vasopressors on patients given chlorpromazine. Lear and his associates[10] report the following:

> . . . in their early experiences with hypotension, they attempted to raise the blood pressure with a number of vasopressors (Desoxyn, Ephedrine and Neo-synephrine); none of these drugs was found to raise the blood pressure consistently even with maximum intravenous doses, and particularly after barbiturates.

Yet Lipton and Hershey's[8] and Dundee's[4] observations do not agree with the reports that correction of the fall in blood pressure is difficult with usual vasopressor administration. The observations of this study, only one instance of hypotension encountered, coincide with Morris and co-workers,[2] who used small amounts of chlorpromazine during spinal anesthesia, and found that any hypotension encountered responded to any vasopressor administered. Perhaps it is probable that the adrenolytic effect of chlorpromazine is sufficiently incomplete with these small doses of the drug to allow for satisfactory correction of hypotension with reasonable amounts of vasopressor agents.

Vandewater[6] reported that all inhalation and intravenous anesthetic agents were potentiated by chlorpromazine. He stated that after the drug was used in combination with all agents, the best combination was thought to be undoubtedly nitrous oxide and intravenous meperidine hydrochloride or nitrous oxide with trichloroethylene.

In Group 2 in this study, the average dose of 2.5 per cent thiopental sodium used for the 50 patients without chlorpromazine was 23.7 cc. or 600 mg. The average dosage of 2.5 per cent thiopental sodium used for the 50 patients with chlorpromazine was 16.2 cc. or 400 mg. The reduction was 7.5 cc. or 200 mg. per person.

Table 3

Postoperative vomiting

Series	No. of cases	No. of patients who vomited		
		Once only	2 to 4 times	Total
Control				
Children	25	6	4	10
Adults	50	5	6	11
Total	75	11	10	21
Chlorpromazine				
Children	30	2	0	2
Adults	50	1	1	2
Total	80	3	1	4

Postoperative vomiting was considered in some detail after numerous reports of the efficacy of the antiemetic properties of chlorpromazine. Vomiting after anesthesia remains the most common complication that the anesthesiologist has to treat in the immediate postoperative period, for it occurs in a fourth of all patients receiving general anesthesia. The number of times that a patient vomited between the end of the operation and the time he left the clinic was recorded in all instances (Table 3).

It is necessary to compare not only the over-all incidence of vomiting, but also the number of times which the patient vomited. The results are, therefore, subdivided into patients who vomited only once, and patients who vomited two to four times.

When the two series was considered as a whole, the conclusion was that fewer patients vomited in the chlorpromazine series than in the control series, and that those who did vomit, vomited less frequently.

A single emesis of secretions collected in the stomach and esophagus during operation is a frequent occurrence. It is difficult to see how any antiemetic can prevent this. Table 3 shows that more patients vomited once only in the control series than in the chlorpromazine series. Fewer patients who had emesis went on to have further emesis in the chlorpromazine series, than in the control series. This result is confirmed when the subgroups are considered. It is therefore suggested that when the effect of an antiemetic on postoperative vomiting is considered, a reduction in the percentage of patients who vomit more than once is more significant than a reduction in the total percentage of patients who vomit (that is, including those patients who have had to vomit only once).

■ *Summary*

The discussions set forth in this paper are based primarily on clinical experiences during the last five months with 155 cases of minor oral surgery. The study was conducted by the staff of the department of oral surgery at Henry Ford Hospital. All the surgical procedures were performed under general anesthesia using only chlorpromazine and atropine or scopolamine as a premedication.

It is the impression gained from this study that although chlorpromazine is not

a wonder drug, it eventually will find a place in the oral surgeon's armamentarium. The ability to reduce the amounts of preoperative narcotics, and hence respiratory depression, should prove of value. The most important action by chlorpromazine would appear to be its ability to allay anxiety and produce conscious indifference to the patient's surroundings. The ease of induction despite the absence of barbiturates and premedicant narcotics is noteworthy. The antiemetic effect of the drug is remarkable. The value of this property in the oral surgery office needs no elaboration.

It should be emphasized that the postural hypotensive effects of this drug may preclude its use in general anesthesia given in the dental chair with the patient in an upright position and that further study of this factor is needed.—*1129 Mott Foundation Building.*

Differential diagnosis of temporomandibular joint pain

■ *Jack B. Caldwell, D.D.S., M.Sc., San Francisco*

Pain has been described as a "disagreeable sensation produced by the action of stimuli of harmful nature."[1] It is the chief complaint of almost every patient suffering from disorders of the temporomandibular joint. Since it is usually the first symptom that causes patients to seek professional care, it is a very important one and warns that joint damage is impending or has already occurred. Pain is entirely subjective, which makes accurate evaluation difficult. The dentist must assess the patient's perception of pain by his (the patient's) interpretation of his reactions to it. Correct evaluation of the symptoms is then dependent on a detailed description of the nature of the pain, its precise location and extent, its constancy and variability and conditions accentuating or relieving it.

Most patients are limited in descriptive terms to "dull," "sharp," "aching," "tender," "full," and so on. It is probably better to obtain this description of pain in the patient's own words, even though limited, and to supplement it by suggestion only after the patient has exhausted his vocabulary. In practice it seems that

Presented before the Sections on Oral Surgery and Periodontics, ninety-seventh annual session, American Dental Association, Atlantic City, N. J., October 2, 1956.

Colonel, Dental Corps, United States Army; chief of oral surgery, dental service, Letterman Army Hospital.

1. MacBryde, C. M. Signs and symptoms, ed. 2. Philadelphia, J. B. Lippincott Co., 1952, p. 7, 171.

patients react differently to pain stimuli, being influenced by fatigue, irritability, suggestion and emotional stability or instability. In controlled studies, however, it has been shown that pain thresholds in humans varies but slightly.[2-4]

At first temporomandibular joint pain may be interpreted by the patient as an earache or a neuralgia. Because of this, many are seen initially by physicians, especially otolaryngologists. Fortunately, physicians are familiar with the "temporomandibular syndrome" because it has received considerable attention in periodical literature outside the dental field.

In 1934 Costen[5] described a symptom complex which subsequently became known as Costen's syndrome. Among the disturbances described were pain in the temporomandibular joint region, crepitation in one or both joints, tinnitus, diminished hearing acuity or deafness and vertigo. He attributed these conditions to mandibular overclosure which permitted posterior displacement of the condyle resulting in pressure to the auriculotemporal nerve, irritation of the chorda tympani and compression of the eustachean tubes.

Since then Costen has reported many other findings related to temporomandibular joint dysfunction, most of which have become a part of the syndrome. In fact, until recent years, this syndrome became a repository for the temporomandibular joint symptoms which did not fit into other well defined categories. This situation still exists to a great extent in medical circles.[6] Certain anatomic and functional misconceptions have been corrected more recently, which has resulted in a clearer understanding of the etiology of temporomandibular joint pain.[7-12]

Since the purpose of this paper is differential diagnosis of temporomandibular joint pain, a primary objective must be the categorizing of derangements and diseases of this joint. Bellinger[13] has classified internal derangements of the joint into four categories, (1) traumatic arthritis, (2) infectious arthritis, (3) rheumatoid arthritis and (4) degenerative joint disease. Since this classification is based on "the same well understood disease processes that affect other joints of the body," it is simple and practical.

Ankylosis, subluxation, luxation (dislocation) and fractures may be placed in one of these categories, depending on etiology. Therefore, for the sake of simplicity, Bellinger's classification will be used as a basis in the following discussion.

■ *Pain in Traumatic Arthritis*

Traumatic arthritis may be defined as any acute traumatic affections of the temporomandibular joint resulting from strains, severe blows, falls, dislocations

2. Schumacher, G. A., and others. Uniformity of pain threshold in man. Science 92:110 Aug. 2, 1940.

3. Wolff, H. G. Some observations on pain. Harvey Lecture Series 39:39, 1943-1944.

4. Wolff, H. G., and Hardy, J. D. On nature of pain. Physiol. Rev. 27:167 April 1947.

5. Costen, J. B. A syndrome of ear and sinus symptoms dependent upon disturbed function of temporomandibular joint. Ann. Otol., Rhin. & Laryng. 43:1 March 1934.

6. Costen, J. B. Classification and treatment of temporomandibular joint problems. Ann. Otol., Rhin. & Laryng. 65:35 March 1956.

7. Sicher, H. Temporomandibular articulation in mandibular overclosure. J.A.D.A. 36:131 Feb. 1948.

8. Sarnat, B. G., editor. The temporomandibular joint. Springfield, Charles C Thomas, 1951, p. 82-110.

9. Sicher, H. Positions and movements of the mandible. J.A.D.A. 48:620 June 1954.

10. Nagle, R. J. Temporomandibular joint function. Oral Surg., Oral Med. & Oral Path. 8:500 May 1955.

11. Sicher, H. Structural and functional basis for disorders of the temporomandibular joint. J. Oral Surg. 13:275 Oct. 1955.

12. Batson, O. V. The anatomist looks at the temporomandibular joint. Trans. Acad. Ophth. & Otol. 60:413 May-June 1956.

13. Bellinger, D. H. Internal derangements of temporomandibular joint. J. Oral Surg. 10:47 Jan. 1952.

with tear of ligaments or capsule or other severe trauma, including fractures extending into the joint.[13] Chronic joint disease caused by repeated minor trauma is no longer included here. The diagnosis is usually obvious since the association of pain immediately after the traumatic episode is readily recalled. The exception is in instances when patients do not seek professional care, but "live with" the pain until it disappears or is not troublesome.

Traumatic lesions, if untreated, frequently heal in such a way that abnormal excursions of the temporomandibular joint and malocclusion result. Months or even years later, recollection of the acute trauma may be difficult, although in the meantime favoring the injury will have resulted in degenerative changes of a more chronic nature. This important group of disorders will be dealt with in the category of degenerative joint disease.

Diagnosis of traumatic arthritis of the temporomandibular joint is based on a history of acute trauma and pain plus observations of limited mobility, occasionally muscle spasm and ecchymosis superficially. Pain in acute traumatic inflammation of the joint may be constant, becoming exquisite with opening or complete closure or on palpation.

Pressure exerted on the joint with the end of the little finger inside the external acoustic meatus of the ear will invariably produce pain in patients who have any acute arthritic condition, be it traumatic in origin or due to other causes. This is a most reliable diagnostic observation and is present even though injury has been minimal.

In instances of fracture dislocation, the absence of the condyle from its normal position of repose can also be detected readily, but pain may not be elicited to a significant degree when finger pressure is exerted.

Roentgenographic examination may confirm the presence of fractures of the head or neck of the condyloid process and though unreliable, clouding may be observed and interpreted as hemorrhage within the joint space.

Treatment or counsel to the patient is indicated when any of these conditions are observed.

■ *Pain in Infectious Arthritis*

Infectious arthritis of the temporomandibular joint is due to a specific organism and may be caused by direct wounds to the joint or surgical procedures, blood borne infections, or by direct extension from adjacent regions of infection.[13, 14] As might be expected of any pyogenic infectious process, it may occur in an acute suppurative state and progress to chronicity without suppuration.

I recall treating a number of patients during the Korean conflict who had sustained combat injuries involving their temporomandibular joints and who were suffering from this disease. I have also treated by arthroplasty, two patients with complete ankylosis after open reduction of condyle fractures. It may be that the incidence of infectious arthritis will rise in direct ratio to the present trend toward open surgical operations in or adjacent to the temporomandibular joint. It is appropriate, even though this paper does not deal with treatment aspects of the tem-

14. Comroe, B. I. Arthritis and allied conditions, ed. 5. Revised by Hollander, J. L. Philadelphia, Lea & Febiger, 1953, p. 842, 779, 813, 831, 123, 124, 125, 691, 692.

poromandibular joint problems, to emphasize the need for strictest aseptic technic and antibiotic prophylaxis when this surgical procedure is undertaken.

The occurrence of blood borne infections involving the temporomandibular joint are seen less frequently now than formerly. Even before antibiotics, gonorrheal arthritis was observed in the temporomandibular joint in only 2 per cent of patients with joint involvement.[14] Tuberculous arthritis of the temporomandibular joint was so insignificant as to be computed "with other regions involved."[14] In a series of 10,000 syphilitic patients, chronic lesions of all the joints were seen in only 0.6 per cent, although syphilitic lesions of bones occurred in about 9 per cent.[14] Isolated reports of metastatic infectious arthritis of the temporomandibular joints are found in the literature. Recently, in an interesting case reported by Winters,[15] the infection was due to *Staphylococcus albus* (coagulase negative), but the primary source of the infection was not discovered.

Clinical observations include (1) constant severe pain which increases to throbbing proportions when acuteness of the inflammation and the distention of the joint capsule with pus become great, (2) immobility of the affected joint because of increased pain on movement. Presence of other classical signs of acute inflammation are less significant. Systemic and laboratory findings are typical of any infectious process.

A complete history and physical examination are essential in the search for a primary focus. In this search for a primary location of infection, additional conditions to be ruled out include sinusitis, pyelitis, furuncles, mastoiditis, otitis media, peritonsillar abscess, infected wounds, pharyngitis, meningitis, osteomyelitis, pneumonia and septicemia. Joint involvement may follow any of these infectious processes or other similar conditions. When the history and clinical and laboratory evidence are sufficient to make a presumptive diagnosis, aspiration of the joint is indicated. It is exceedingly important that samples of the suppuration be obtained for culture prior to administration of antibiotics so that the infection, regardless of its primary source and causative bacteria, can be treated specifically.

In chronic states of infectious arthritis, synovial fibrosis occurs, and pain is ordinarily not a prominent symptom. Limited mobility and ankylosis are frequent sequelae.

■ *Pain in Rheumatoid Arthritis*

The cause of rheumatoid arthritis remains unknown. Characteristics of an inflammatory process found in this disease suggest that it may be of infectious etiology. However, competent bacteriological investigations of blood, synovial fluid and other affected tissues have shown no causative infectious agent. The sex incidence of the disease (two to three females to one male) suggests an association with gonadal function.[14] Hormones capable of producing remission of the disease (adrenocorticotrophic hormone (ACTH), hydrocortisone (Compound F) and cortisone (Compound E)) gave hope of finding its cause in endocrine disease. Most investigators have concluded,

15. Winters, S. E. Staphylococcus infection of temporomandibular joint. Oral Surg., Oral Med. & Oral Path. 8:148 Feb. 1955.

however, that these benefits are a result of the anti-inflammatory effects of these hormones, and understanding of the etiology has not been advanced materially.

There is no specific pattern of development of rheumatoid arthritis. The onset may be at any age, but it is most common between the ages of 20 and 45. There is a tendency for progression of the process from peripheral joints toward the trunk, with the order of frequency of joint involvement in the proximal interphalangeal joints of the fingers, metacarpophalangeal joints, knees, wrists, elbows, ankles, shoulders, hips, and temporomandibular and sternoclavicular joints.

The disease has an insidious onset characterized by complaints of general malaise, easy fatigability, numbness and tingling in the extremities, weight loss, and general debility. The first indications of joint involvement are pain, swelling, and a feeling of warmth in the region. Usually the proximal interphalangeal joints of the fingers are affected first. It is within the realm of possibility that this set of circumstances with the temporomandibular joint involved first could be the clue to the initial diagnosis of this generalized disease. Such a situation is certainly an exception to the usual course of events, but every clinician should be alert to the possibility.

It is estimated that about 20 per cent of patients with rheumatoid arthritis develop the disease in the temporomandibular joint. The disease is often advanced to the point of flexion contractures and even ankylosis of joints of the extremities before the patient complains of temporomandibular joint pain. By this time they have been receiving treatment for the generalized disease and attention to a single joint is not considered important. These are most likely the reasons why few patients with this disease come to the attention of the dentist.

When observed, rheumatoid arthritis involving the temporomandibular joint has characteristics similar to those seen in other joints. On palpation there is both tenderness and crepitation with motion. Since the inflammation ordinarily is not acute, pain usually is described as a constant "dull" or "aching" type, intensified by movement. The same destructive changes may occur in the temporomandibular joint as elsewhere, causing deformity which in turn produces a malocclusion with destruction and deformity, irregularities of joint surfaces develop and pain may be increased. Ankylosis is rarely a sequela in the temporomandibular joint. In children with the juvenile form of the disease, interferences with development frequently result in a micrognathic deformity of the mandible and Class II (Angle) malocclusion.

■ *Pain in Degenerative Joint Disease*

Degenerative joint disease (osteoarthritis, hypertrophic arthritis, degenerative arthritis, arthritis deformans, and senescent arthritis) is a chronic arthropathy characterized pathologically by degeneration and hypertrophy of the cartilage and bone and clinically by pain.[14] It is generally believed that the condition is related to the physiologic process of aging, aggravated by strain, trauma, dysfunction and deformity. Contrary to the popular belief that this is entirely a disease of middle or old age, it has been shown that

alterations characteristic of degenerative joint disease may make their appearance as early as the second decade of life.[14] It is a physiologic process of aging, not a disease of old age.

This fact is borne out by a review of the records of 28 patients with degenerative joint disease seen at Letterman Army Hospital during the past six months. The average age of this group of patients was 35.4 years. One was 60, three were in their fifties, four in their forties, 11 in their thirties and nine in their twenties. Only seven of the 28 were men, giving a sex incidence of three women to one man. This observation does not differ from that seen in a civilian type practice, since all classes and age groups are treated in the Letterman clinic. A better understanding of the etiology and pathogenesis of degenerative joint disease makes acceptance of its clinical symptomatology in younger age groups more tenable.

The disease may manifest itself in the temporomandibular joint in a variety of ways, but pain is always a symptom. Classically pain occurs with movement, but a dull ache may persist with rest. This pain ordinarily results from the slightest intraarticular or extrinsic trauma. Ordinarily functional movements of mastication may be responsible but wide excursions of the condyle, such as occur with yawning or biting over a French roll, are more apt to precipitate a painful reaction. Stiffness and limited mobility characteristically follow, this is a typical observation after the patient has had a night's rest.

On the other hand, hypermobility may be observed frequently with pain occurring at the farthest excursion of the condyle over the articular eminence or as the condyle seeks to return to the glenoid fossa. This hypermobility occurs as a result of the loose attachment of the articular disk (meniscus) to the joint capsule. Associated with this condition is the crepitation often referred to by the patient as popping, cracking or grating sensation, which is frequently noisy.

Other degenerative changes of marginal proliferations, (spurs, osteophytes, lipping and exostoses) may be present and contributory. Almost invariably, whether hypermobility is present or not, irregularity of excursions of the two condyles can be detected. This irregularity is so exaggerated in some patients that it becomes a gyration or a functional accommodation developed by habit to avoid pain. Invariably this may be traced back to loss of teeth, unilateral mastication, ineffectual dental prosthesis, malocclusion, sleeping habits, and a host of other contributing factors or a combination of several. Any of these represent, when transmitted to the joint, repeated microtraumas.

History of previous acute severe trauma should not be overlooked either. The pain associated with degenerative joint disease is usually localized in the joint, but may radiate locally or be referred to the side of the head, occipital region and down the back of the neck. Stiffness and tenderness of the masticatory muscles may also be a complaint and may be related to bruxism which in turn is probably due to nervous tensions associated with occupational or personality conflicts. As can be seen, the facets of the whole problem are so intricate and interrelated that cause and effect are often difficult to distinguish one from the other.

■ *Differential Diagnosis*

The temporomandibular joint as a source of pain to patients has become so prominent in the past 30 years that there has been a tendency to place the blame there for all sorts of facial, head and neck pains. Differentiating these pains is often a tedious undertaking and requires consultations with various other departments of a hospital or clinic. Of interest, also, is the fact that patients are referred to dentists for consultation supposedly regarding Costen's syndrome when the temporomandibular joint is not the problem.

REFERRED PAIN—Referred pain has been described[8] in simplified language as: . . . an overflow of incoming pain stimuli from one nerve pathway to another. It is a central phenomenon with one peripheral source of irritation but with other simulated or referred manifestations of pain in other peripheral areas which are supplied by branches of the same nerve or by other nerves closely related at their origin or termination.

This explains why pain originating in the temporomandibular joint may be felt in the vertex of the head, in the occipital region, in the neck and elsewhere. By this same mechanism, pain primary in the paranasal sinuses, teeth, ears and other structures may manifest itself in the temporomandibular joint. Probably the pain most difficult to differentiate is that originating in the ear or the joint itself because of anatomic proximity. For this reason it is essential that thorough dental examinations, including complete roentgenographic survey and otorhinolaryngeal examination, be made. Differential diagnosis of dental pain ordinarily is not difficult. Maurice[16] has recently published an excellent article on the subject.

THE NEURALGIAS—The character and distribution of pain and so-called "trigger zones" make differential diagnosis of the various neuralgias from temporomandibular arthralgia relatively easy. Trigeminal neuralgia (tic douloureux) is characterized by paroxysmal attacks of pain of lancinating severity, provoked by stimulus to a certain skin area (trigger zone), anatomically limited to the distribution of the trigeminal nerve. Once a patient with this affliction has been observed, such pain will never be mistaken for temporomandibular joint pain. Glossopharyngeal neuralgia is similar to tic douloureux except for the location of the pain and trigger zone. The pain is much the same except that it usually radiates to the side of the neck, angle of the mandible and ear. The trigger point is located at some point in the pharynx. Sphenopalatine neuralgia (Sluder's neuralgia) is characterized by a constant burning type of pain in the maxilla which may be referred to the nose, eye, ear, maxillary teeth, palate and pharynx.[17,18]

ARTHRALGIA, UNEXPLAINED — Occasionally a patient will complain of constant or recurrent pain although repeated examinations fail to reveal any evidence of joint disease or abnormality. The pain is described as a "soreness" or "aching." The etiology cannot be explained but may be on a psychogenic, allergic or toxic basis. Such patients should be observed over a

16. Maurice, G. M. Differential diagnosis of dental pain. J.A.D.A. 50:316 March 1955.

17. Thoma, K. H. Oral pathology, ed. 3. St. Louis, C. V. Mosby Co., 1950, p. 1012, 1013.

18. Comroe, B. I.; Collins, L. H., and Crane, M. P. Internal medicine in dental practice, ed. 3. Philadelphia. Lea & Febiger, 1949, p. 217-219.

period of time, since such pain may be a prodromal manifestation of a slowly developing chronic arthritis. In the meantime, this condition can only be referred to as an unexplained arthralgia.[1]

TUMORS INVOLVING TEMPOROMANDIBULAR JOINT—The possibility of tumors occurring in the temporomandibular joint must be considered when differential diagnosis is being made. Hypertrophy, osteochondroma and osteoma represent the largest number of tumors of the condyle to be reported. Fibrosarcoma and metastatic tumors are the more serious affections, although other tumors have been observed. Altogether, tumors involving the condyle and temporomandibular joint are rare. Pain may be a symptom and the distinguishing of the clinical observations from those made when more common derangements of the joint exist requires careful study.[19]

■ *Roentgenographic Examination*

Roentgenographic examination of the temporomandibular joints is mandatory for all patients who have symptoms referrable to this joint. Absence of positive findings does not rule out a disorder, and in fact positive findings are rarely demonstrable except when the condition is gross in extent. I have never been impressed by reports of spurs, erosions or exostoses. In fact, in a number of instances, repeat exposures were made only to find that by slight variations in positioning and angulations, previously reported abnormalities no longer were present when the roentgenograms were interpreted.

It is true that subluxations and luxations can be visualized readily on the roentgenogram, but these are also positive clinical observations. Variations in the size of the joint space can only be seen through roentgenographic examination, but clouding is often a result of technical factors of exposure and position. If for no other reason, roentgenograms are essential to rule out a pathologic condition resulting from a tumor. Standard technics of exposure and position are strongly recommended so that technical variations can be kept to a minimum; thus can interpretations be made with confidence.[20, 21]

■ *Conclusions*

To understand temporomandibular joint disease, it is necessary to have a sound knowledge of the anatomy and function of the joint and of generalized joint disease. To make a diagnosis of derangements of the joint or simulated conditions, it is necessary to have the investigative ability of a Sherlock Holmes. Differential diagnosis is based on a careful complete history taking, and clinical, laboratory and roentgenographic examinations. In many instances the dentist must devote considerable time during repeated visits of a patient. He must also be willing to refer patients for consultation and treatment to others who are qualified in various specialties to a higher degree than he is. Definitive treatment should not be undertaken until all studies and consultations have been completed and a diagnosis has been established.

19. Thoma, K. H. Tumors of condyle and temporomandibular joint. Oral Surg., Oral Med. & Oral Path. 7:1091 Oct. 1954.

20. Updegrave, W. J. An improved roentgenographic technic for temporomandibular articulation. J.A.D.A. 40:391 April 1950.

21. Updegrave, W. J. An evaluation of temporomandibular joint roentgenography. J.A.D.A. 46:408 April 1953.

Treatment of the painful temporomandibular joint

■ *Fred A. Henny, D.D.S., Detroit*

The problem of diagnosis and treatment of the painful temporomandibular joint has received much attention in both dental and medical fields since Goodfriend[1] in 1933 expertly outlined the problem. His work was followed by the more publicized work of Costen[2] in 1934. Costen's publications received wide publicity and acceptance in both professions, and since his theory of etiology was based on a decrease of the normal maxillary-mandibular vertical dimension, much of the subsequent study and treatment followed that line of reasoning.

Since that time, continued investigation and study has resulted in an improved insight into the problem. Currently, it is felt that the decrease of vertical dimension is in reality a minor factor in the production of joint symptoms. Increasing the vertical dimension has on occasions actually proved to be of more harm than benefit. To understand best the complexities of treatment of the painful temporomandibular joint, some organized discussion of its etiology is in order.

As stated, the original theory advanced by Costen advocated a diminished vertical dimension as the etiologic agent in the production of a syndrome that bears his name, which included pain, unilateral loss of hearing associated with compression of the eustachian tube, tenderness of the joints to palpation and tinnitus. As a result, much emphasis was placed on increasing the vertical dimension to remove pressure, theoretically, from the articular disk whether the relation was clinically diminished or not. The insertion of cork disks and tongue blades between the upper and lower posterior teeth was used frequently as a diagnostic supplement. The utilization of dental appliances to increase vertical dimension became common practice, sometimes despite the presence of a clinically normal occlusion. However, muscle balance and tone had their usual influence; as a result it was found that teeth frequently were forced into infraocclusion with subsequent periodontal bone loss and persisting joint symptoms.

Since that era there has been a gradual enlightenment with the realization that loss of vertical dimension was usually not the important contributing factor in the production of pathologic joint conditions. This changing attitude developed because many patients with a definite diagnosis of joint degeneration and pain have a normal vertical dimension whereas many other patients who are edentulous or have a gross decrease of the vertical dimension are entirely asymptomatic. Actually, few patients with complete dentures develop joint symptoms since those who clench and grind their teeth usually develop sore mouths instead.

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1. Goodfriend, D. J. Symptomatology and treatment of abnormalities of mandibular articulation. D. Cosmos 75:844 Sept. 1933.

2. Costen, J. B. Syndrome of ear and sinus symptoms dependent upon disturbed function of the temporomandibular joint. Ann. Otol., Rhin. & Laryng. 43:1 March 1934.

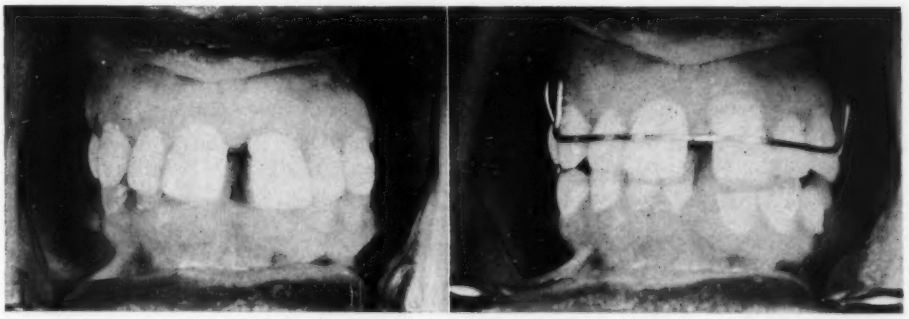

Fig. 1—Left: Deep overbite associated with bruxism and temporomandibular joint pain. Right: Bite plane in place with contact on lower anterior teeth only

At present, all available information on painful temporomandibular joint points to a multiplicity of causes, occurring singly or in combination. Of these, tension states combined with some occlusal abnormality are the most common. Interestingly, the typical occlusal derangements are no more severe than those commonly seen in patients without joint symptoms. Occlusal discrepancies that may be present, however, are accentuated by bruxism and in that fashion contribute greatly to ultimate joint degeneration.

Tension states produce muscle tension and spasm in many parts of the body resulting in pain that usually has no demonstrable organic basis. The masticating group of muscles frequently are involved when they produce abnormal pressure on the temporomandibular joint. Patients with this condition develop a subconscious habit of clenching of the jaws or grinding of the teeth. This may occur during sleep, but may also commonly take place during the usual waking hours. This usually reflects a general tension state, but may simply be a tension release during periods of concentration. Eventually periodontal bone loss occurs in some patients, whereas in others, inflammatory pressure changes and edema are produced within the temporomandibular joint.

Occlusal discrepancies may vary considerably. They include the following:

1. Loss of vertical dimension with overclosure during mastication or periods of jaw clenching (Fig. 1, left). This, of course, results in abnormal pressures on joint structures which produce inflammatory changes in the periarticular structures with subsequent restriction of condylar movement, joint tenderness and pain.

2. Loss of any tooth or teeth without early replacement is usually followed by drifting and tipping of the teeth, anterior, posterior and superior or inferior to the edentulous region. This acquired malocclusion disturbs normal occlusal function and produces cusp interference which contributes greatly to alteration in joint function and degeneration. This change combined with tension is the most frequently noted clinical state.

3. Inherent malocclusion may also produce cusp interference with subse-

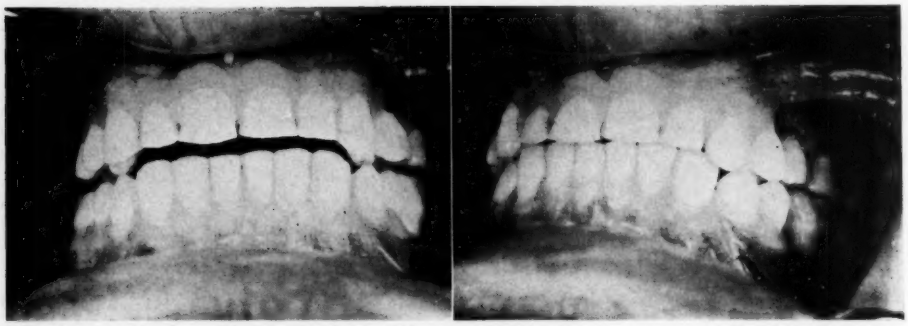

Fig. 2—Left: Centric position with overextended eruption of maxillary third molar preventing closure in this position. Right: Centric position after extraction of maxillary third molar allowing teeth to come into occlusion

quent joint changes. It may even be noted during or after orthodontic treatment, and, in such circumstances, it demonstrates clearly that cosmetic rearrangement of the teeth does not necessarily have a good physiologic result.

This classification includes third molar teeth which so frequently erupt in a bizarre fashion. The maxillary third molar may erupt in a posterolateral direction so that it is positioned eventually in the normal pathway of the anterior border of the ramus of the mandible during its excursion forward in the opening motion. This causes deviation of the mandible to miss the third molar which in turn may produce sufficient alteration in normal function to produce an acutely painful joint. The treatment in such instances is, of course, simple since it entails only the extraction of the offending tooth to reestablish a normal pathway for the mandible.

In other instances, a lower third molar tooth may be impacted and unerupted, or may be missing. In such an event its maxillary counterpart may overextend its eruption into the region opposite and produce occlusal interference against the posterior surface of the lower second molar (Fig. 2, left).

4. Improper prosthetic appliances and dental restorations may result in painful temporomandibular joint. Early reconstruction of edentulous regions usually is recommended to prevent disruption of occlusion and future joint degeneration. However, a prosthetic appliance or dental restoration when inserted without due consideration for the restoration of normal occlusion may produce sufficient deleterious changes in occlusion to promote future joint degeneration. A careful review of the patients with painful temporomandibular joint will frequently pinpoint the onset of symptoms to a date shortly after the insertion of an improperly constructed prosthetic appliance or dental restoration. Again it must be noted that many patients with inadequate appliances or restorations do not subsequently develop joint pain, but when this condition is accompanied by tension and resultant bruxism or clenching of the teeth, the

occurrence rate of joint pain is greatly increased.

Single acts of trauma, such as a blow to the jaw or less frequently dislocation of the mandibular condyle, also may produce sufficient edema and inflammation in the periarticular structures to cause persistent joint pain. This may even occur during the period of immobilization of the jaws after a fracture, giving rise to the observation that jaw immobilization is not a panacea for joint pain. Instead, immobilization of the teeth in occlusion when edema exists in the soft tissues of the joint may increase compression and pain.

■ *Treatment*

As has been mentioned, many varied factors are involved in the production of temporomandibular joint pain. As a result any treatment plan must take these factors into consideration if it is to be successful in a high percentage of cases. Basically, all treatment should include general supportive care, elimination or control of extrinsic tension factors that may be present and the production of normal balanced occlusion without cusp interference during function.

GENERAL SUPPORTIVE TREATMENT—General supportive treatment includes four main factors:

1. The application of dry heat to the affected part, either by infrared lamp or electric pad for a period of one half hour twice daily, is helpful.

2. Limitation of jaw motion is a commonly misunderstood factor since many patients feel that if some degree of trismus is present, it is wise to exercise the jaw by chewing gum or by some other means to aid in its mobility. Since the actual alteration is best described as a joint strain, it is wise to limit function as much as possible. Complete immobilization of the jaws usually is unwise; therefore, voluntary limitation of motion by the patient is the better course.

3. Subsistence on a soft diet is beneficial since it materially reduces trauma to the joint and may also reduce pain. A rather varied diet can be followed with the exception that tough, chewy articles of food must be eliminated, and large forkfuls or spoonfuls of food should be avoided. Most meats, at the outset of treatment, should be either of fine texture or ground prior to cooking. As symptoms disappear, the rigidity of the diet can be relaxed. All patients, however, should be admonished to be protective of the joint in the future, accepting it as a weakened part, as patients who have back strain, old knee injuries and tennis elbow are protective of these portions of their anatomy in any physical exercise in which they indulge.

4. Administration of salicylates is also helpful. Salicylates should be given by prescription either in the form of the acetyl or sodium salicylate structure in doses of 10 grains, one half hour before meals and at bedtime. Their use aids in joint rest and muscle relaxation, in addition to increasing comfort. This dosage schedule should be continued throughout the active period of treatment. If additional analgesic effect is desired, the same dosage of aspirin compound can be utilized. It should be noted that when salicylates are given by prescription, patients are more likely to follow the dosage schedule carefully than if advised to pur-

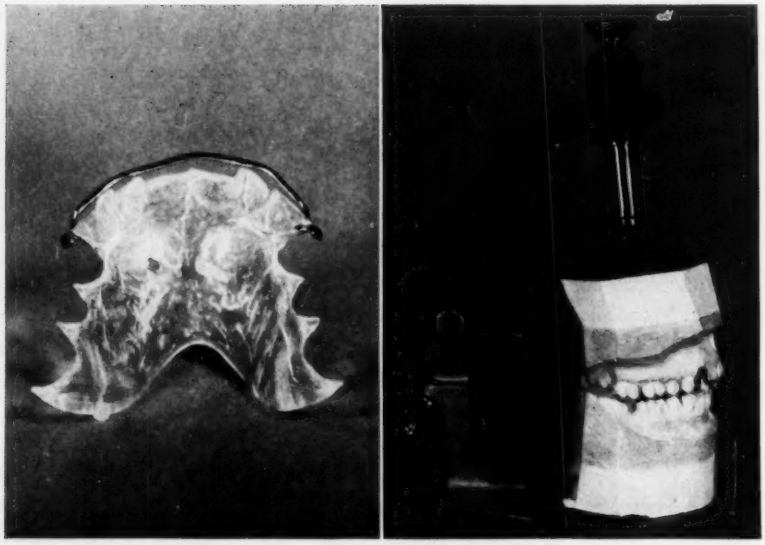

Fig. 3—Left: Bite plane as constructed for use in upper arch. Right: Bite plane in position in articulated models. Occlusion is on lower anterior teeth only, preventing bruxism.

chase their own supply with oral instructions for their use.

ELIMINATION OR CONTROL OF EXTRINSIC TENSION FACTORS—As mentioned previously, a tension state is one of the two commonly found factors in patients with persistent temporomandibular joint pain. Since this is usually on an intangible basis, it may be difficult to eliminate completely. It is usually impracticable to delve into neuropsychiatric aspects of the patient's problem except in severe cases. The usual procedure is one of attempting to effect enough control to aid in the elimination of the patient's joint symptoms.

Nocturnal grinding and clenching of the teeth and thrusting of the jaw forward during the waking hours is a common reflection of a tension state. If there is evidence of this, or it is admitted by the patient, it is of course wise to point out the importance of elimination of this subconscious habit.

The use of a bite plane, especially during the sleeping hours, aids considerably in breaking this habit (Fig. 1, right). When it is in place, the occlusion is taken away from the posterior teeth, with only a smooth polished surface anteriorly which the lower incisor teeth contact (Fig. 3). It is, of course, impossible to clench or grind against this surface; thereby it aids the patient in his efforts to break his habit pattern.

Judicious use of barbiturates and muscle relaxants is also of benefit in reduction of the degree of tension that is present. As mentioned previously, active psychotherapy can be utilized in severe cases and here the psychiatrist may prove to be of considerable benefit. Usually, a

common sense program involving the reduction or elimination of the factors that are causing the tension state, increased out-of-door exercise and mild sedation, in combination with local treatment will produce satisfactory results.

RESTORATION OF NORMAL OCCLUSION —Occlusal equilibration is of primary importance in any treatment plan. The elimination of occlusal interference by judicious and carefully planned reduction of tooth structure, the extraction of hopelessly positioned teeth (Fig. 2, right) and physiologic reconstruction of carious teeth and edentulous regions all combine to contribute greatly to elimination of joint trauma and pain.

Occasionally, joint pain is so great and trismus is so severe that it becomes impossible or impracticable to attempt occlusal equilibration. In such circumstances local symptoms can be improved by intra-articular injection of hydrocortisone. This is usually done under local anesthesia by injecting 1 cc. containing 25 mg. of hydrocortisone into the upper joint space.[3] Care should be exercised to minimize trauma to the joint structures since this may add to the pathologic condition that is already present. Usually, a 25 gauge needle is adequate and with careful injection into the roof of the glenoid fossa little damage is done (Fig. 4).

Symptomatic relief from such a procedure usually is prompt; but without correction of occlusal discrepancies and other conservative treatment, the pain ordinarily recurs in two to three weeks. How-

3. Henny, F. A. Intra-articular injection of hydrocortisone into the temporomandibular joint. J. Oral Surg. 12:314 Oct. 1954.

Fig. 4—Hydrocortisone injection into upper space of temporomandibular joint. Injection is made when roof of glenoid cavity is contacted by point of 25 gauge needle

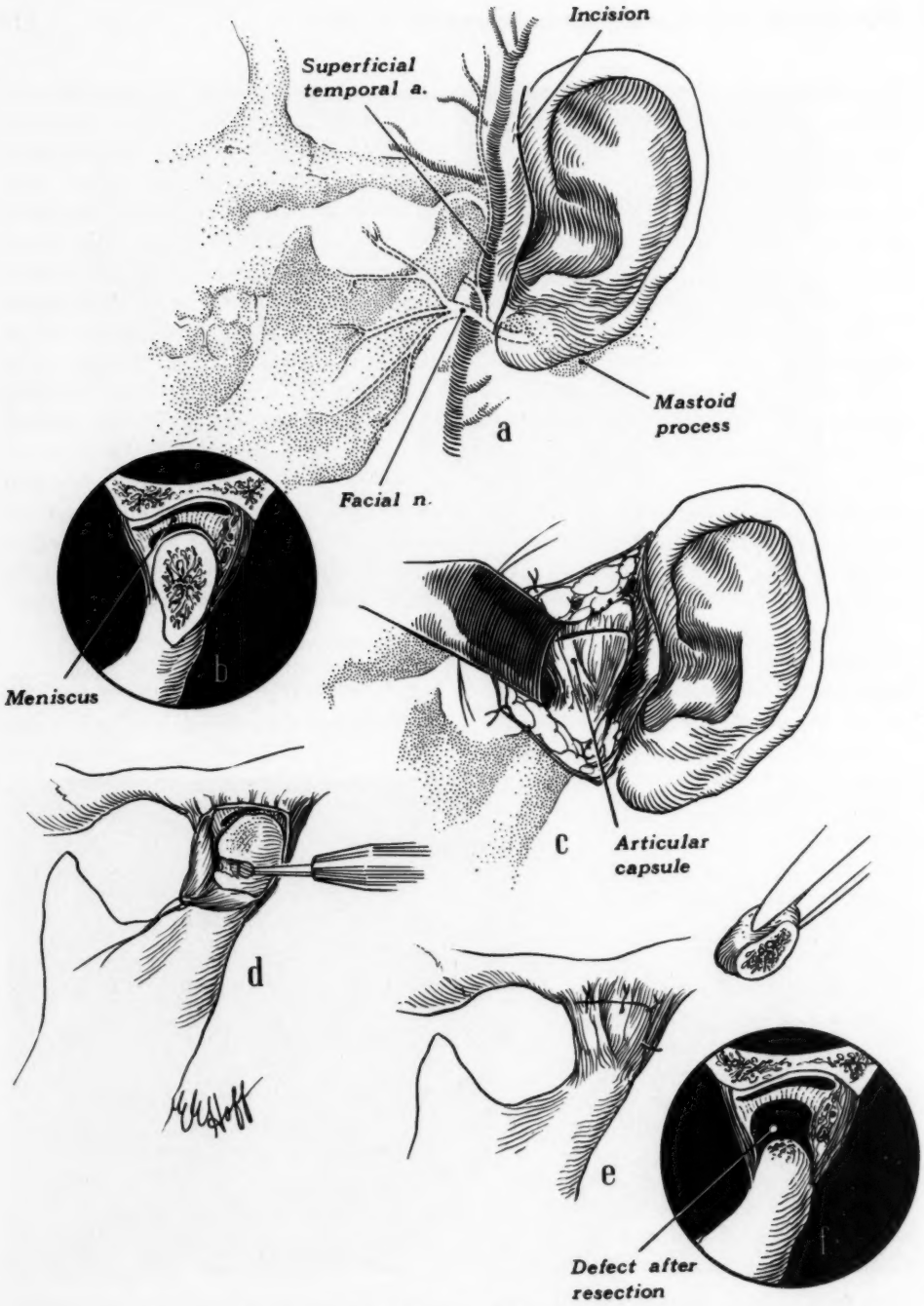

Fig. 5—High mandibular condylectomy

ever, this is usually sufficient time for occlusal equilibration and construction of a bite plane, if one is required. Hydrocortisone injection, therefore, may be a useful adjunct to a successful treatment program.

Roentgen ray therapy has also been reported as beneficial in the reduction of joint symptoms. Goodrich and Johnson[4] reported a series of 45 cases with this type of treatment. The effects of roentgen ray therapy are similar to those obtained when hydrocortisone is used, since its success is based on reduction of any local inflammation that may be present.

Here again it is imperative to eliminate the causative factors that are present, since with the passage of time, they will again reassert themselves. At Henry Ford Hospital, radiation therapy has been used sparingly, since it has been of inconsistent benefit and necessarily includes some radiation to the parotid gland which, of course, is undesirable.

Fortunately, the vast majority of patients with painful temporomandibular joints respond to the total treatment program described previously. A small percentage, however, are resistant to all forms of conservative therapy. Failures most frequently occur in the tense, nervous women patients in whom muscle tension and grinding and clenching habits have a continual effect on the joint. Various types of treatment for these resistant cases have been described. For a period of time, it appeared that meniscectomy by open operation was the answer. However, with the passage of time, many such patients have had recurrent pain, probably due to regeneration of tissue in the intra-articular space and resurgence of the factors that produced the painful joint originally.

In an attempt to contribute to a better understanding of such resistant cases, Sicher[5] has found by anatomic research that the innervation of the joint region is not in the meniscus, but instead is found in the loose connective tissue posterior to the meniscus. This important anatomic study has shed new light on the problem and explains the frequent failure of meniscectomy, since the meniscus has no actual nerve supply.

In another work, by the author,[6] the successful utilization of high mandibular condylectomy in 20 resistant cases with excellent long term results was reported (Fig. 5). Elimination of pain and preservation of good function have been universal. Sicher's work lends credence to this procedure, since high condylectomy eliminates traction and pressure on the meniscus and region of nerve supply.

It is of interest to note that in this series of 20 cases, the meniscus was left undisturbed. This is important since it aids in the development of normal postoperative function and prevents the formation of adhesions between the resected neck of the condyloid process and the roof of the glenoid fossa. It must be emphasized that although this operation appears to be of universal benefit, it should not be utilized until the usual conservative therapy has been carried out without relief.

4. Goodrich, W. A., Jr., and Johnson, W. A. Roentgen ray therapy of the temporomandibular joint. J. Oral Surg. 14:35 Jan. 1956.

5. Sicher, Harry. Structural and functional basis for disorders of temporomandibular joint. J. Oral Surg. 13:275 Oct. 1955.

6. Henny, F. A., Baldridge, O. L. Condylectomy for the persistently painful temporomandibular joint. J. Oral Surg. 15:24 Jan. 1957.

■ *Summary*

At present all patients with painful temporomandibular joints can be given efficient and usually complete relief from pain and dysfunction. An improved insight into the physiology, anatomy and pathology of the joint and its relation to occlusal alterations and tension states has aided materially in the over-all improvement of treatment in the past 20 years. Patients with joint conditions which resist treatment can be given relief by high mandibular condylectomy, provided that occlusal equilibration has been carried out preoperatively, that the condylectomy is performed at the correct level and that the meniscus is left intact for future function. Further study of the tension factors in production of this interesting syndrome is needed to reduce further the necessity for surgical intervention.

The training of the oral surgeon

■ *William F. Harrigan, D.D.S., M.D., New York*

The teachers of oral surgery in various universities are given a task that is difficult to carry out. They are given 1.5 to 2 per cent of a four year curriculum to educate and train dentists whose license conferred on them by the various states will allow them to perform oral surgery as defined by the House of Delegates of the American Dental Association in 1953.

This definition of oral surgery and its scope is as follows:

> The specialty of oral surgery is that part of dental practice which deals with the diagnosis, the surgical and adjunctive treatment of the diseases, injuries and defects of the human jaws and associated structures.
>
> The scope of the specialty of oral surgery shall include the diagnosis, the surgical and adjunctive treatment of the diseases, injuries and defects of the human jaws and associated structures within the limits of the professional qualifications and training of the individual practitioner and within the limits of agreements made at the local level by the health team concerned with the total health care of the patient.

No one can deny that this is an excellent definition; however, it is excellent only to the degree that the good will and spirit which is implicit in it is adhered to by the practicing members of the profession. For this definition to be fulfilled, adequate graduate training is imperative since so little time can be devoted to the study of oral surgery at the undergraduate level.

Since so much oral surgery is per-

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formed in private offices, it becomes a matter of moral honesty and conscience on the part of the individual dentist as to what his scope of practice shall be. As far as major oral surgical procedures are concerned, there is some control at the hospital level; even this is not always true, however, for private and proprietary hospitals are arising where staff proficiency may not be all that is desired.

Until a few years ago, undergraduate dental education in oral surgery left much to be desired. The newly graduated dentist had little but his recently conferred dental degree to qualify him to treat patients. Some took short courses which at their best were meant only to systematize and orient what he already knew; they would not qualify him as a specialist. Therefore, if oral surgery is to be a true specialty, graduate training programs associated with affiliated hospitals are a necessity. It is being recognized more and more that the development of an oral surgeon is brought about by adequate graduate training; however, this idea still needs fostering by all teachers of graduates in dentistry.

It is very difficult to teach even the theory of major oral surgery and have it accepted by undergraduate students since they know they are not going to utilize it except at a graduate level. The recent graduate, therefore, has an inadequate knowledge regarding what oral surgery actually is. It is only at the graduate level that dental students really appreciate what oral surgery is and its ramifications. This lack of understanding of oral surgery is one of the reasons why certain medical specialties have made inroads into the field.

■ *American Board of Oral Surgery Requirements*

The founding of the American Board of Oral Surgery in 1946 is the best move that has occurred in oral surgery in recent years. It is to the disadvantage of oral surgeons that it was not founded sooner. Some may disagree with some of the actions and policies of the Board, but it must be remembered that all new organizations have growing pains. The objectives of the Board are sound, however, and it is the duty of all teachers of oral surgery to train candidates who are not only fit to pass the Board but are also imbued with its basic ideals and principles. Certainly all oral surgeons are familiar with the requirements of the Board, but those related to special training will be outlined briefly.

Advanced training in oral surgery for three years or more in a recognized graduate school or hospital which has been approved for such training by the Council on Dental Association of the American Dental Association is required. This training shall cover the clinical and technical phases of oral surgery and an academic year of advanced study in the basic sciences as they are related to oral surgery. In addition to these three years, two additional years of work devoted exclusively to oral surgery are required.

The director of an oral surgery service, in order to maintain an adequate training program, has three main problems:

1. The selection of personnel.
2. Instruction in the basic sciences.
3. The organization of the clinical service so that it shall be of the greatest

possible value to the house staff who are to receive the training.

A year's rotating internship or some time in general practice is desirable before a man goes into formal training in surgery. No intelligent educator will deny that a broad general training is helpful to the future oral surgeon, and that it makes him a better specialist.

A point that should be mentioned in connection with the problem of selection of personnel is the present policy of the Armed Forces in procuring medical and dental personnel. Physically qualified dental interns are liable for military service after one year's internship. Up until now, there has been a program providing for the deferment of men in medical specialties. So far there has been little action on the part of the military and no action by organized dentistry to defer young men who desire training in oral surgery for more than one year. The Navy has granted reserve commissions to some interns and deferred calling them to active duty until they have received some specialized training in oral surgery. Therefore, at present there is an acute shortage of young properly trained oral surgery specialists in the Armed Forces.

In evaluating the candidates for internship, their potential abilities are judged by their record in dental school, the unbiased opinion of their deans and former instructors, and information that may be gathered in a personal interview. In this interview, it is possible to evaluate the personality of the candidate, his background, and his earnestness of purpose. His chief interest can be learned—whether it is for an academic career or the career of a private practitioner. Primarily, his philosophy as regards oral surgery is judged.

The future oral surgeon received instruction in basic sciences during his undergraduate years; however, this instruction was given three to four years previously and much of it probably has been forgotten. What is more important is that these subjects, when taken, were not applied to oral surgery.

The American Board of Oral Surgery has a specific requirement regarding instruction in basic sciences as related to oral surgery. Instruction in oral surgery must be so systematized that the future oral surgeon may utilize these basic sciences in his clinical work. Therefore, proper teaching and laboratory facilities must be made available to these men. Obviously, this can best be handled in a university.

At the New York University School of Dentistry, therefore, a year's basic science course has been set up in conjunction with the Graduate School of Medicine at the University. Graduate students in oral surgery take courses in anatomy, surgical anatomy, pathology, roentgenographic interpretation, oral tumors, relation of oral surgery to prosthodontics, technics of exodontics, anesthesia, maxillofacial injuries, pain syndromes, oral medicine and basic medicine. They also take basic science courses with the general surgery basic science students. These courses include pathological physiology, surgical physiology, and biochemistry, pharmacology and tumor surgery. Time is also spent at Beekman St., Meadowbrook and Memorial Hospital wards and clinics.

It is obvious that such a course as this cannot be given while the student is a resi-

dent or intern; it is too time consuming. Therefore, the question of when it should be given comes up as regards sequence. At the New York University School of Dentistry, it is felt that it should follow the intern year. The ideal sequence would be, then, intern, basic science year, assistant resident, resident. Practically, this cannot always be carried out.

It might also be added that it is the duty and obligation of the director of the oral surgery service to see that the instruction in this course is adequate. He must know the content of the various courses and see that they are strengthened or deleted as may be necessary in order to carry out a good program. At the New York University this has been accomplished partly by an evaluation by the students themselves who take the course.

So far only the selection of personnel, the basic science course and the training in clinical instruction required by the American Board of Oral Surgery have been discussed. The Board also requires five years in oral surgery inclusive of the formal training and basic science year.

In the New York University College of Dentistry course, a boy may spend three to four years. Then comes the problem of whether he should have a practice of his own or become an associate of an established oral surgeon. This latter could be called preceptorship, if desired. The value of a preceptorship depends on the ability and the personalities of the two individuals. Although oral surgery is classified as a surgical specialty, it also involves oral medicine, internal medicine, physiology, physiological chemistry, bacteriology, pathology and other scientific disciplines. In spite of the individual skill and brilliance of a particular preceptor, it is impossible for him to cover the many fields mentioned. The preceptor years, therefore, could not be substituted for formal training. A combination of formal training and preceptorship may be ideal.

■ *Internships and Residencies*

It is important to discuss internships and residencies for graduate training in oral surgery in associated teaching hospitals. By associated teaching hospitals is meant hospitals that are associated with teaching institutions. It is natural to expect that the finest teaching should come from these affiliated hospitals. This does not mean that good teaching and good training cannot come from nonaffiliated hospitals, for much of it can and does. In this paper, how the New York University-Bellevue Dental and Medical Center approaches the problem will be discussed.

The service at Bellevue and its affiliated hospitals is a pyramidal service. There are six interns, two assistant residents, and one resident. Also, there is a resident at the New York Veterans Hospital which is in the Center, and a resident at Meadowbrook Hospital which is affiliated with the New York University-Bellevue for teaching purposes. All the second, third and fourth year appointees come out of our internships, if possible. This is what is meant by a pyramidal service. The better men reach the top positions. Therefore, New York University-Bellevue Dental and Medical Center has the facilities to train five men each year beyond the intern level, exclusive of the basic science course.

The six interns spend two months each on the following six services: (1)

roentgenography; (2) exodontics; (3) diagnosis and fractures; (4) psychiatric clinic and house staff; (5) anesthesia; (6) University Hospital.

All of the house staff are under the director of the service and 39 attending dentists. Insofar as possible, many of the men hold teaching positions at the New York University College of Dentistry. At present, 22 of the 39 attending dentists are teaching at the school. The services are supervised by the attending staff who are assigned to duty on various days. The assistant resident and resident also act in a supervisory capacity when they are available.

The two months on roentgenography are well spent. Here the intern takes preoperative and postoperative roentgenograms of all patients. These include intraoral as well as extraoral views and the films are taken and developed in the outpatient oral surgery clinic.

In exodontics, the intern spends two months in the outpatient clinic. Here he performs all types of extractions and alveolectomies and handles minor intraoral problems. He does not operate if difficult impactions are present as these are handled by the assistant resident and resident. The intern is supervised in all his work.

The two months spent on diagnosis and fractures are divided into diagnosis and the simple wiring of fractures. He works with the assistant resident and resident in the outpatient clinic. Diagnosis consists of seeing the patient when he arrives in the clinic and making the necessary diagnosis, ordering roentgenograms to be taken and recording the findings on the patient's chart.

Psychiatric and house service consists of two months in the psychiatric building clinic. At Bellevue there is a separate psychiatric clinic where inpatients in psychiatry are seen. Here the intern actually is in the position of a resident for two months. In other words, he handles any and all oral surgical problems that arise under the supervision of the attending staff. If there are patients requiring operations that are to be scheduled in the psychiatric operating rooms, he schedules them after consultation with the resident and he assists at the operation.

House service means that the intern is on duty for consultations, dressings on inpatients, and as junior intern, assists in the care of operating room patients. What is most important, he sees to it that the necessary instruments are on hand so that operations proceed smoothly. He also takes a complete history, makes a local physical examination, and does all the necessary preoperative laboratory work that is required.

On anesthesia service, the intern spends two months in the general anesthesia department in the operating rooms. He not only assists the resident staff in anesthesia, but he also administers anesthesia under supervision. This is a very worth-while service, as he is actually assigned to the department of anesthesia for this period.

The two months' service at University Hospital is a period at the private hospital which is included in the New York University-Bellevue Medical Center. Here the intern has his own outpatient service and he assists the chief of the service and attending staff with various operations. He also attends a well

established tumor clinic at the New York Skin and Cancer Hospital Division while at University Hospital.

The following listing will indicate how many patients were seen and the type of operations performed during the three month period from July 1, 1955, to September 30, by the dental service at Bellevue Hospital, Meadowbrook Hospital, and New York Veterans Administration Hospital.

There were 6,162 outpatients seen, 113 admissions, and 3,719 consultations held. The treatment varied from the simple repair of lacerations, biopsies, extractions, incisions and drainage to the treatment of more complicated extractions, excisions of tumors, closure of oroantral fistulas, Caldwell-Luc operations, open reductions, excision of submaxillary gland, condylectomies and correction of prognathism.

There are two assistant residents. Their services are divided into two six month periods—six months on anesthesia and six on surgery. While on anesthesia service, they are members of the anesthesia department and administer all types of anesthesia, both for general and oral surgery. This means they get good training in intubation. They and the resident also give anesthetics to the children in the outpatient department. General anesthetics are not given to adults in the outpatient department, but if they require anesthesia they are admitted to the hospital. While on surgery service, the assistant resident operates and is first assistant to the resident and attending staff for all patients who have been operated on.

The resident's duties are similar to those of a master sergeant; he is the focal point of the entire service. It might be added that the services are covered at all times. There is 24 hour duty and one half of the house staff is on call every other night and every other week-end.

The importance of oral surgery training in a general hospital must be emphasized. It is important for the resident to rub shoulders day by day and hour by hour with his confreres on other hospital services which often are closely related to his own field. It is of value for the oral surgery resident to see a patient after a severe accident involving, let's say, the jaws, cranium, skeletal bones and internal viscera. Along with the residents on these other services, it is important for the oral surgery resident to be present and to take part in the discussions and the making of decisions that involve the whole patient as well as the face.

The fact that the oral surgery trainee must gain the confidence of his fellow residents and must interest them in oral surgery problems is of great educational value not only for the oral surgery trainee but for the house staffs of the medical specialties as well. No amount of knowledge imparted by visiting staff members and didactic teaching can ever compensate for the loss of this continual personal contact with other services.

This brings up the question of autonomy. In many sections of the country the cry of autonomy is being raised by various heads of oral surgery services. Just what they desire is a mystery to me. If they desire equal status with other medical specialties, they are entitled to it, but only insofar as they can assume equal responsibility. If they desire autonomy in oral

surgery to the extent of divorcing oral surgery from the various medical specialties, they are digging a deep grave for oral surgery. The mouth cannot be separated from the rest of the body any more than can the eye, the ear or the big toe. There is a difference between administrative autonomy and scientific and clinical autonomy.

An oral surgery service should be organized so that it provides the best possible care for the patient and at the same time provides maximum training facilities for the house staff. There are certain things that the chief-of-service should keep in mind. The service should be set up for the best possible applicants. Since there are so few services at the residency level that are available to the recent graduates, they should not be set up for the mediocre man. Therefore, the service is designed for full speed ahead for the intelligent and inquisitive mind. The plodder should be exposed to all that the service has to offer, but the tempo of pace should not be set at his level.

The chief-of-service must also know his own limitations and abilities. He cannot cover the entire field of oral surgery, and he must select and rely on his staff, keeping in mind compensation for his own deficiencies. Therefore, the staff should be selected for the particular capabilities that they might contribute to the training program. It is the duty of the chief-of-staff to see that all fields are covered, regardless of his own interest or lack of interest in any special subject.

It is the duty of the chief-of-service to assume the major burden of routine clinical instruction. Even though this becomes tiresome and repetitious, it is the only way that he can learn to know his house staff, both their shortcomings and their accomplishments. These he must know if he is to apply the pyramidal system and promote his better men to higher positions.

Training may be divided into instruction in surgical technic and instruction in the use of sound surgical judgment. The first presents little difficulty. The embryo oral surgeon is eager to learn and quickly acquires the dexterity necessary for accomplishing a surgical procedure. This surgical technic must be taught in the operating room; therefore, the intern serving as assistant to his seniors on the resident staff learns the general technic for the various surgical procedures. The assistant resident and resident should serve as assistant to staff members with their private patients. Here with personal instruction, the young resident with good hands can learn the details of operative oral surgery to such a degree that he may become as skilled as his teacher, for youth has confidence, is not handicapped by tremor of arteriosclerosis and by presbyopia.

In this type of service, the embryo oral surgeon should have the maximum opportunity to gather experience. If this is to be accomplished, he must have operative material. Therefore, surgical patients in the wards should be operated on by the resident staff.

The chief-of-staff and his senior attending staff should operate only when the case is of an extremely difficult nature or where there are some personal reasons why the older man should intervene. It is assumed that the older men have had their training so they should step aside

and give full opportunity to the resident staff. If such systems are not put into practice, oral surgery will remain as static as it has been for years. It is this method that has provided excellent training for medical men for years and should be emulated so as to provide a real future for oral surgery.

The acquisition of surgical judgment is more difficult. Probably one of the best requisites for any surgeon is to know when not to operate. This is another way of saying that surgical judgment is more important than surgical technic. As is well known, common sense is actually not common. Without common sense there can be no judgment. A professional man without common sense or judgment is a menace to the patients he serves. Graduates of schools are seen who are totally lacking in common sense. This raises the question as to whether the emphasis on marks for admission is entirely justified. Marks, which too often are obtained by the memorizing of facts, are of no use unless these facts can be organized into logical thinking. The general training of the intellect is sometimes neglected in present day education.

Surgical judgment is learned by repetitious service at the clinic chair and on ward rounds. The surgical problem involved in each case, the various procedures available, the ones best suited to meet the individual needs of the patient, the dangers involved in each, the safety precautions that can be taken to minimize dangers of operative and postoperative complications, must all be considered and discussed.

The embryo oral surgeon should be exposed to such thoughtful examination of conscience for errors of commission or omission. In learning by experience, it is possible to learn more from mistakes than from successes. It is only by such a long and tedious course that mature surgical judgment is developed. Such a course of study continues forever in the life of a sound professional man. The more time he spends in hospitals and surgical meetings, the better he becomes. This is done at a personal sacrifice since it means less time in productive office practice.

After the three to four years spent in the program of the New York University-Bellevue Dental and Medical Center, the resident is ready to venture into independent practice. The degree of his skill and judgment is dependent on his individual qualities and his training. Some men need more. In a pyramidal service, it is up to the chief-of-service to weed out the incompetent. Just because a man spends time does not of necessity make him a finished product.

Since so few places are available for adequate training, time cannot be spent on the mediocre or average man. It is about time the needs of the extraordinary man are met. The outstanding man should be encouraged to stay with the system and the affiliated hospital after he has finished. He could spend his time as a personal assistant to the chief-of-service where he would keep in daily contact with the chief and his private patients. He also should be encouraged with private patients of his own. He can keep in contact with research projects and administrative problems that pertain to any well run service.

This approach enables the young oral surgeon to assume more responsibility,

to make decisions and to stand on his own feet. He is now ready to make a decision as to whether he will remain in academic oral surgery or will go into private practice or make some compromise between the two. If he decides on an academic life, he is ready for an appointment on the teaching staff of the school and the affiliated hospital as an assistant professor. It is from such a pool as this that future teachers, future professors of oral surgery and future department heads must be recruited. If teaching appointments are left to chance, social connections, influence and the like, the specialty of oral surgery will suffer.

■ *Training in Anesthesia*

The problem of anesthesia has been left to the last. It is amazing that dentistry, the mother profession of anesthesia, has done so little toward its advancement since it was discovered by two dentists, Morton and Wells. Anesthesia, so far as the life and death of the patient is concerned, is more important than the surgery. Therefore, a man cannot be a surgeon and an anesthetist at the same time.

A man who goes through the New York University-Bellevue Medical and Dental Center program has eight months' training in all kinds of anesthesia for all kinds of surgery. Such a man is not an accomplished anesthetist. After these months he has learned a respect for anesthesia.

If dentistry had programs to train anesthetists adequately, the time spent by the house staff on anesthesia would be lessened and their surgical time would be increased. However, for the ordinary office procedure which should be relatively short, the house staff receives adequate training. Today there is a trend toward carrying out longer office procedures under general anesthesia, not only surgical procedures but other phases of dentistry as well. I feel that this tendency is wrong. It is particularly wrong if the anesthetist has spent only a minimum of time in preparation to become an anesthetist.

If a dentist under his license but not under his conscience can administer a long anesthesia with all of its possible complications, then the medical men have wasted their time in setting up a two year service to train anesthetists. No fair minded individual will deny that many of the complicated general surgical as well as oral surgical procedures that are handled today are a triumph of the training of well qualified anesthesiologists. These persons become qualified not by taking short courses or through haphazard methods but through sound training which takes time. Therefore, if dentists are going to give long anesthesias, adequate training programs should be provided, so that dentists may become trained for a specialty within dentistry mainly concerned with anesthesia.

■ *Comment*

Much time has been devoted in this paper to the scientific qualifications which the chief-of-service must seek in his resident staff and teachers. There is another function of the chief-of-service. He must train his house staff to believe in discipline and to scorn softness, both in work and in character. His staff should be trained not only as products of a scientific discipline, but what is more important, they should be humanitarians.

Use of freeze-dried homogenous bone grafts in the surgical positioning of teeth

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Numerous technics of replantation and transplantation of teeth have been used throughout the years with varying degrees of success.[1-9] In addition, the surgical positioning of fully erupted teeth in a one-step procedure has been considered as indicated in some instances in preference to the slower methods of orthodontic movement.[10] The term *redressément forcé* has been used to describe this form of surgical positioning.[10-12] One of the most recent modifications of this latter procedure has been reported by Holland.[11,12] He used the term "surgical orthodontics" to describe a technic involving the bringing into occlusion of unerupted or impacted teeth by a one-step surgical procedure. In this latter procedure, the unerupted tooth is surgically exposed, and a new alveolus is prepared in the bone in the adjusted location for proper alignment of the repositioned tooth. By moving the tooth carefully into its corrected position, the root apex is not exposed.[11,12]

Although Holland suggested that this technic might be utilized in adult patients, the use of this procedure with the older age groups poses many problems. For example, the surgical movement of a tooth of an adult which has a mature constricted apical foramen will, in all probability, disrupt the nerve and blood supply of the pulp. Despite the contention that there may be a return of pulpal vascularity in certain instances of transplantation of mature teeth in adults,[13] and although regeneration of blood vessels from mesenchymal cells of the adult pulp is considered possible,[12] the regeneration of the sensory pulpal nerve fibers is less probable.[13]

Another serious obstacle to early clinical success with a surgically positioned or transplanted tooth in an adult lies in failure in the development of a new attachment of the periodontal structures. It was believed that this failure of attachment might be due to a postoperative in-

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

Lieutenant Commander, Dental Corps, United States Navy, Department of the Navy.

1. Noble, F. P. Autotransplantation: report of three cases. J. Oral Surg. 12:54 Jan. 1954.

2. Miller, H. M. Tooth transplantation: report of case. J. Oral Surg. 9:68 Jan. 1951.

3. Miller, H. M. Transplantation and reimplantation of teeth. Oral Surg., Oral Med. & Oral Path. 9:84 Jan. 1956.

4. Apfel, H. Autoplasty of enucleated prefunctional third molars. J. Oral Surg. 8:289 Oct. 1950.

5. Apfel, H. Preliminary work in transplanting the third molar to the first molar position. J.A.D.A. 48:143 Feb. 1954.

6. Hale, M. L. Autogenous transplants. Oral Surg., Oral Med. & Oral Path. 9:76 Jan. 1956.

7. Kauffer, H. J. Root implantation, physiologic and mechanical. Items Interest 37:33 Jan. 1915.

8. Bodecker, C. F., and Lefkowitz, M. N. Replantation of teeth. D. Items Interest 57:675 Aug. 1935.

9. Kromer, H. An auxiliary device for performance of replantation. Brit.D.J. 84:210 May 21, 1948.

10. Thoma, K. H. Surgical positioning of erupted teeth in torso-occlusion. Oral Surg., Oral Med. & Oral Path. 9:125 Feb. 1956.

11. Holland, D. J. Surgical positioning of unerupted impacted teeth (surgical orthodontics). Oral Surg., Oral Med. & Oral Path. 9:130 Feb. 1956.

12. Holland, D. J. A technique of surgical orthodontics. Am. J. Orthodont. 41:27 Jan. 1955.

13. Pafford, E. M. Homogeneous transplants of preserved frozen teeth; a preliminary report. Oral Surg., Oral Med. & Oral Path. 9:55 Jan. 1956.

flammatory process,[13,14] and that the relatively large space between certain surfaces of the root of the repositioned tooth and the wall of the reshaped alveolus were conducive to a supervening inflammatory process.

It has been pointed out that an infected environment with its accompanying low pH is not favorable to cementoblastic activity and to the reattachment of collagenous fibers to the tooth surface.[15-17] It was believed, however, that if these regions between the reshaped alveolus and the repositioned tooth could be filled with a compatible bone graft which would act as a scaffold to orient the new bone formation of the host and as a possible stimulus to the osteogenic cells of the host,[19] a more favorable result could be obtained in the surgical repositioning of unerupted teeth of adult patients.

To determine the efficacy of using banked freeze-dried homogenous bone grafts in the surgical repositioning of fully developed impacted teeth of adults, a pilot study was undertaken in which this type of homoplastic material would be used in the surgical movement of impacted, maxillary cuspids in adult patients.

Transplanted compatible bone fragments in an osseous defect serve as objects for replacement and conduct new bone formation from all sides of the defect toward the center.[18,19] It has been stated[19] that without this effect of the graft fragments, the osteogenic activity, beginning at the edge of the defect, might well subside before the defect is filled. Therefore, an important function of a bone graft is to stimulate its replacement by cells from the host and to conduct osteogenesis from one point to another.[19]

It has been shown that in regions where there is a functional demand for bone, osteogenic cells of the host will be stimulated to replace the bone of the graft material with new osseous tissue.[18] Such a functional demand for and stimulus to new bone formation[17] would be present in the newly created periodontal space of the alveolus of a surgically repositioned tooth. That bone chips placed in periodontal pockets can be tolerated by the host tissue has been demonstrated recently.[20]

The freeze-dried homogenous cancellous bone used in this work was prepared by the tissue bank of the Naval Medical School, N.N.M.C., Bethesda, Md. This graft substance, prepared by the process of freeze-drying as described by Hyatt,[21] has been used successfully in many different types of orthopedic bone grafting procedures.[22] In addition the efficacious application of freeze-dried homografts to the treatment of cystic bone lesions of the mandible and maxilla has been reported recently by Cooksey.[23] The

14. Perint, E. J. Results of reimplantation of posterior teeth after root filling. Oral Surg., Oral Med. & Oral Path. 4:573 May 1951.

15. Butcher, E. O., and Vidair, R. V. Periodontal fiber reattachment in replanted incisors of the monkey. J. D. Res. 34:569 Aug. 1955.

16. Ramfjord, S. Experimental periodontal reattachment in rhesus monkeys. J. Periodont. 22:67 April 1951.

17. Ramfjord, S. Reattachment in periodontal therapy. J.A.D.A. 45:513 Nov. 1952.

18. Ham, A. W., and Gordon, S. Origin of bone that forms in association with cancellous chips transplanted into muscle. Brit. J. Plast. Surg. 5:154 Oct. 1952.

19. Ham, A. W. Some histophysiological problems peculiar to calcified tissues. J. Bone & Joint Surg. 34A:701 July 1952.

20. Forsberg, H. Transplantation of os purum and bone chips in surgical treatment of periodontal disease. Acta Odont. Scandinavica 13:235 Feb. 1956.

21. Hyatt, G. W., and others. New methods for preserving bone, skin and blood vessels. Postgrad. Med. 12:239 Sept. 1952.

22. Carr, C. R., and Hyatt, G. W. Clinical evaluation of freeze-dried bone grafts. J. Bone & Joint Surg. 37A:549 June 1955.

23. Cooksey, D. E. Clinical and animal experiments to investigate the healing properties of freeze-dried bone materials in cysts of the jaws. Thesis, Graduate School, Georgetown University, 1954.

placement of this material in the bony defects after the enucleation of dentigerous and radicular cysts[23] and after exposure of extravasation cysts,[24] appears to effect a rapid return to normal of the osseous tissue. Clinically, such grafted regions heal without incident, and there is roentgenographic evidence of the early occurrence of osteogenic activity with eventual replacement of the graft by normal viable bone.[24] The presence of freeze-dried graft particles within the defect apparently creates an environment favorable to the proliferation and orientation of new bone formation from the host.[23]

■ *Procedure*

Impacted unerupted maxillary cuspids in four patients were surgically positioned into normal alignment in the dental arch by the procedure described. The surgical technic as outlined by Holland was followed in these instances with the following exceptions:

1. The considerable distance through which these teeth with mature constricted foramens were required to be moved precluded any attempt at maintaining pulpal vitality through rotating the tooth while keeping the apical root movement negligible.

2. Where the repositioned tooth lacked inherent stability through a wedging effect in the reshaped alveolus, the tooth was fixed in position by means of orthodontic bands.

3. After the tooth had been positioned in the prepared alveolus, fragments of freeze-dried homogenous cancellous bone of suitable size were selected and placed in the space between the tooth and the alveolus wall. These cancellous fragments were carried in some instances to the apical one fourth of the root in order to fill discrepancies in the new "periodontal space." The freeze-dried graft material had been reconstituted to its previous physical properties by insertion in a physiological saline solution 20 minutes prior to the operation. It has been shown that this freeze-dried bone substance may be reconstituted to its previous physical properties with any fluid which is physiologically and osmotically acceptable; that is, normal saline solution, plasma, or the patients own hematoma.[22] One case is reported here to illustrate the surgical technic.

■ *Report of Case*

The patient, a 25 year old, white man, reported to the dental service on December 10, 1955, with the complaint of pain and tenderness in the area of a "loose tooth," which the patient stated had become progressively mobile during the preceding six months. The patient also said that he had been informed by a dentist two years previously that this tooth was a deciduous one, and that its permanent successor was "impacted." The dentist at that time had made no recommendation as to treatment. The past and family histories were noncontributory.

EXAMINATION—Examination revealed a young, white man in no apparent distress. Intraoral examination disclosed a mobile, deciduous, maxillary right cuspid.

24. Boyne, P. J. Treatment of extravasation cysts with freeze-dried homogenous bone grafts. J. Oral Surg. 14:206 July 1956.

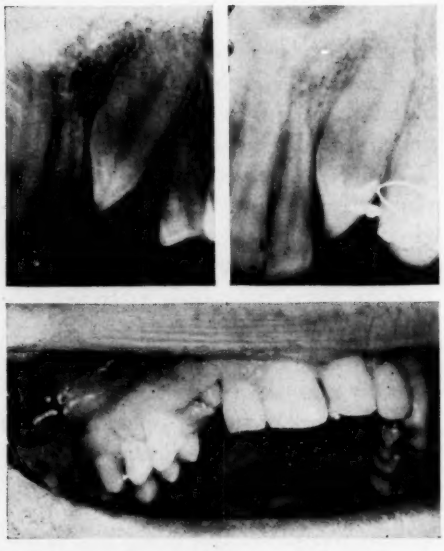

Fig. 1—Above left: Preoperative view demonstrating mesioangular impacted permanent, maxillary cuspid with retained deciduous cuspid in place. Permanent cuspid is rotated so that labial surface faces distally. Above right: Periapical view taken after attempts to erupt impacted cuspid by traction had produced only a slight degree of vertical movement. Tooth is prevented from further eruption because of fact that wide labiolingual diameter of tooth faces in mesiodistal direction which causes tooth to contact lateral incisor and bicuspid roots. Below: Degree of eruption prior to surgical movement. After traction in an effort to move impacted cuspid into position, partially exposed tooth is prevented from further eruption by its 90 degree rotation and the impinging of its root on lateral incisor and bicuspid roots

There was no clinical evidence of an inflammatory process in this region, and the remaining oral structures were normal. The patient possessed a full complement of teeth with the exception of the maxillary left lateral incisor which had been replaced by a fixed bridge prosthesis.

Roentgenographic studies (Fig. 1, above left) revealed a deciduous maxillary right cuspid with an almost completely resorbed root and an unerupted maxillary right permanent cuspid which was impacted with a mesial inclination and rotated so that the labial surface of the tooth faced distally. Occlusal roentgenograms showed the impacted cuspid to be midway between the labial and lingual cortical bone plates.

TREATMENT — On December 15, under 2 per cent lidocaine infiltration anesthesia, the deciduous tooth was extracted and the crown of the permanent cuspid was uncovered surgically without actual surgical movement of the tooth. After exposure of the crown of the impacted tooth, a gold pin was cemented into the labial portion of the crown for possible use as an attachment for a traction appliance at a later date. A celluloid crown form was cemented over the exposed portion of the tooth. The crown form was removed five weeks later at which time downward movement of the impacted tooth appeared to be negligible. A traction appliance was then inserted, which utilized the pin that had been inserted into the crown of the tooth. It was felt that if the tooth could be erupted sufficiently by this method, the rotation of the tooth could be corrected by another appliance.

This treatment failed to erupt the tooth to any degree because the rotated tooth, with its wide labiolingual surface that faced mesiodistally, impinged on the roots of both the lateral incisor and the bicuspids, and thus further eruption was prevented (Fig. 1, above right and below). Because of the failure of this conservative treatment, it was decided to reposition the tooth surgically utilizing a freeze-dried homogenous bone graft.

Laboratory examination prior to this surgical procedure showed that bleeding and coagulation time, urinalysis, red and white blood cell count, and differential count were all within normal limits. The hemoglobin concentration was 15.2 Gm., and the results of the Kahn test were negative.

OPERATION—On April 19, 1956, under 2 per cent lidocaine infiltration anesthesia, the following operation was performed. An incision was made at the cervical margins of the right maxillary bicuspids and was carried forward to the right lateral incisor where a diagonal incision was made to the mucobuccal fold. The mucoperiosteum outlined by the incision was raised and the impacted cuspid exposed. The tooth was moved gently (Fig. 2, above left) with forceps which had been modified by molding guttapercha between the beaks as suggested by Thoma.[10]

In this manner, it was possible to determine the portion of the alveolus which needed alteration to accommodate the repositioned tooth. Bone burs and fine narrow chisels were used to recontour the socket and the tooth was moved, again by the modified forceps, into the corrected position (Fig. 2, above right).

Small fragments of reconstituted freeze-dried homogenous cancellous bone were selected and placed between the tooth and the reshaped alveolus (Fig. 2, above right and below). An especially large void in the mesial portion of the

Fig. 2—Above left: Mucoperiosteal flap has been raised and impacted cuspid has been moved by forceps inferiorly but has not been rotated into proper position. Labial coronal surface of tooth is directed distally, representing 90 degree rotation. Pin in labial surface had been used in previous traction procedures. Above right: Alveolus has been recontoured to permit rotation of tooth into proper alignment. Freeze-dried homogenous cancellous bone particles have been inserted between root of tooth and wall of alveolus. Below: View taken first postoperative day demonstrating new position of surgically positioned cuspid. Freeze-dried cancellous particles have been placed around tooth, especially along mesial portion of alveolus, to fill in discrepancies between root and wall of alveolus

alveolus was the space formerly occupied by the crown of the mesioangular impacted tooth. This space (Fig. 2, below) was then well filled with the graft particles.

The mucoperiosteal flap was reapproximated and closed with no. 0000 monofilament nylon interrupted sutures. The tooth was checked for occlusal interferences. No splinting appliance or surgical pack was used. The patient was given 300,000 units of penicillin procaine, intramuscularly, daily for four days. Codeine sulfate (0.5 grain, every four hours), was prescribed for pain. Warm saline mouthwashes were prescribed, to be used every four hours, to begin on the first postoperative day.

The postoperative course was uneventful. Moderate facial edema was present on the day after the operation. This subsided after three days (Fig. 3, left). The patient experienced only mild discomfort, and the sutures were removed on the sixth postoperative day. The patient was seen weekly for follow-up examinations. On the second postoperative week the mobility of the tooth increased slightly; however, no clinical signs of an inflammatory process were present and the patient was comfortable. Thereafter, the tooth became progressively less mobile. At no time, however, could this mobility have been described as anything more than slight. By the seventh postoperative week, it was impossible to detect any mobility clinically, and the tooth had become a useful member of the dental arch (Fig. 3, right).

Follow-up roentgenographic examination in the third postoperative month revealed a tendency toward uniformity of bone density surrounding the tooth (Fig. 4, left), and by the sixth month, almost complete uniformity of osseous structure was revealed (Fig. 4, right). There was no evidence of root resorption or any pathologic process, and an apparently normal lamina dura was visible. Through the nine months' follow-up period, the tooth maintained its normal luster and color. The periodontal structures were clinically normal and there was no evidence of pocket formation.

Fig. 3—Left: View taken on third postoperative day of surgically positioned cuspid. Right: Two months postoperatively, cuspid was immobile and periodontal tissues clinically normal

■ *Comment*

The four patients in whom impacted maxillary cuspids were surgically positioned into alignment exhibited a lack of abnormal mobility of these teeth at the end of the second postoperative month. No untoward postoperative reactions occurred during the follow-up period, which varied from 5 to 12 months. Although all the teeth presented a normal luster and apparently healthy periodontal structures, the repositioned teeth had failed to respond to the electric pulp tester by the end of the follow-up period.

Endodontic therapy is planned at a later date, when it will be possible to determine if revascularization of the pulpal tissue has taken place. If it is found that such revascularization has occurred consistently in these instances, regardless of the response of the teeth to the electric pulp tester, root canal therapy could conceivably be dispensed with in any future use of this procedure.

■ *Summary*

The procedures described were undertaken as a pilot study to gain some indication of the efficacy of utilizing homoplastic osseous material in the application of the surgical positioning technic to adult dentition.

The small number of cases reported and the brief follow-up periods preclude any definite conclusions at this time. Many questions, such as the possibility of eventual root resorption and the probability of revascularization of the pulpal tissue of the surgically positioned fully matured tooth, remain unanswered.

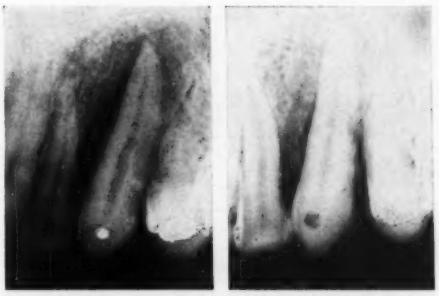

Fig. 4—Left: View taken three months postoperatively demonstrating increase in uniformity of bone density between graft area and surrounding bone. No difference in tooth mobility can be discerned clinically between this tooth and adjacent teeth or opposite cuspid. Right: Periapical view taken six months postoperatively. There is considerable tendency toward uniformity of bone density and trabecular pattern of grafted area and surrounding bone. Height of crestal bone on mesial surface of cuspid is apparently being maintained at level established by graft

The initial clinical success achieved in these instances seems to indicate that when homogenous freeze-dried cancellous bone grafts are utilized in the surgical positioning of adult, impacted, maxillary cuspids, an early clinical attachment or close apposition of the periodontal structures appears to occur, with the alveolar bone of the host apparently (as judged by roentgenographic examination), replacing the graft material with normal osseous tissue. It appears that the repositioned tooth becomes a useful healthy member of the dental arch.

Although proper evaluation of the efficacy of this procedure in the surgical positioning of adult teeth should await more extensive study, this technic has been sufficiently successful to warrant further investigation.

VOLUME 15 • JULY 1957 • NUMBER 3 CASE REPORTS

Surgical correction of bilateral ankylosis of the temporomandibular joints: *report of case*

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Traumatic injuries to the jaws and their supporting structures in children under 12 years of age may present extreme management problems to the oral and maxillofacial surgeon. Perhaps the most important factors relevant to such injuries are the time of initial treatment, the healing time, and the physiologic alterations of the growth patterns in an actively proliferating growth center that are due to trauma. When injury is sustained near a growth center, as in trauma to the condyles, not only will normal growth of the condyles occur because of proliferation of the cartilage, but also there will be immediate reaction of the bone to the injury and local reparative processes will take place. When such injuries are sustained, some means of rapid fixation, early reduction and immobilization with early restoration of controlled function must be achieved. If these conditions are not met, and the child is permitted to recover from the injury without specific therapy, discrepancies of occlusion and function with potential joint ankylosis may result.

REPORT OF CASE—Observations such as those described were made in an 11 year old girl with a history of untreated bilateral trauma to the mandibular condyles.

In June 1953 this white, obese, then eight year old girl had been involved in an automobile accident. She had sustained the following multiple, severe injuries: brain concussion with skull fracture, left forearm fracture, deep laceration of the face and left knee, and bilateral, subcondylar fractures of the mandible with avulsion of the lower permanent incisor teeth. Little or no information was available regarding the treatment that she had received after these injuries except that which the mother could provide sketchily. The immediate complaint was that the child could not move her lower jaw.

The child at birth was a full term, traumatic breech presentation, high forceps delivery. The infant had had difficulty with initial respiration, was anemic, and had a very poor prognosis. She received multiple transfusions on the fifth day of life. The remainder of early growth and development of the girl indicated that there had been a general retardation of all important early functional and developmental phases. From the history presented by the mother, it was noted that the child was aphasic prior to the accident, and that she had not received any schooling or special training. It

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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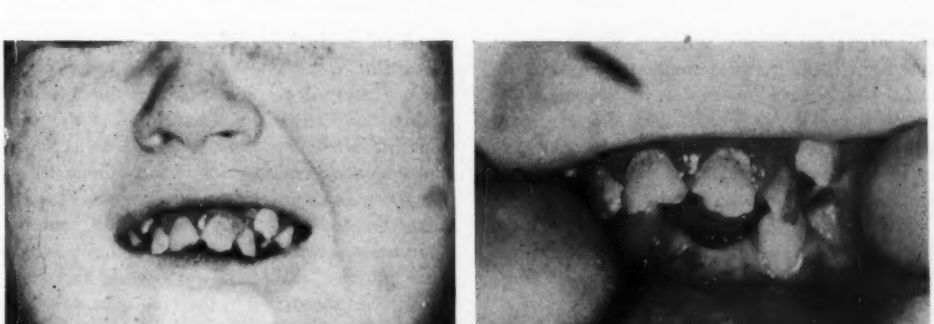


Fig. 1—Preoperative views

was revealed also that after the bilateral osteotomies of the mandibular rami for ankylosis of the temporomandibular joints that were performed in March 1954, the child had shown little or no improvement in her ability to open her mouth, although the alignment of her dental arches was greatly improved.

Physical examination of the child on admission in January 1956 revealed an obese, fairly well developed, white, 11 year old girl who was obviously mentally retarded and in no acute distress. The head was generally symmetrical except for the middle and lower thirds of the face (Fig. 1). No true retrusion of the mandible could be demonstrated, even though the facial contour suggested its presence. This impression was accentuated by the fact that there was anterior maxillary arch narrowing with labioversion of the maxillary anterior teeth and absence of the mandibular incisors. It was impossible to demonstrate any movement of the mandible, either in a vertical or lateral plane; also it was impossible to introduce a piece of paper between the occlusal surfaces of the teeth.

There was a healed scar extending from the vermilion border of the right side of the lower lip to the hyoid bone on the same side. There were two smaller scars in the midline of the neck at the level of the thyroid cartilage which represented the sites of two previous tracheostomies.

Bilaterally, at the angles of the mandible, there were two well healed scars from the prior surgery to the ascending rami of the mandible. Further clinical examination of the mandible and maxilla revealed a mixed dentition in poor repair. Because of the total ankylosis, it was impossible to examine the floor of the mouth, the palate, or the occlusal surfaces of the posterior teeth. The occlusal relationship of the arches demonstrated that the mandibular first permanent molar was approximately one half its own length distal to the normal intercuspal relationship. The deciduous second molars were in position and were intact. The maxilla, which became narrow anteriorly, and the labioversion of the anterior teeth, along with the lack of mandibular incisors, provided the child with the only path of entry for sustenance. It is assumed that much of this labioversion had resulted from the action of the tongue and fingers of the child in seeking some greater means of oral entry. Also of interest is the fact that there was bilateral heterotropia of the nonparalytic type, and an alternating of the eyes in following anything, meanwhile winking tightly and frequently. The fundi were negative, and the pupils reacted normally to light and accommodation.

Management of the patient was made even more difficult by the child's inability to speak. Her vocabulary was composed of childish incomplete words and no complete sen-

tences. Through the untiring efforts of the mother, however, some understanding was established, and considerable cooperation was possible under most conditions. The remainder of the general physical examination was completed by the pediatric department, and there were no contraindications to any surgical procedure, or to the use of a general anesthetic agent other than the mechanical difficulty associated with the child's inability to open her mouth.

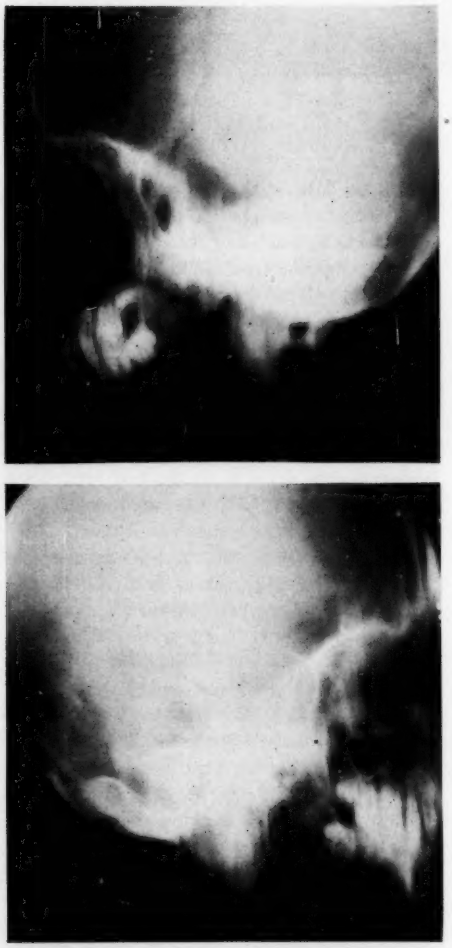


Fig. 2—Preoperative planigrams showing obliteration of joint spaces and previous osteotomies

Roentgenographic studies performed after admission revealed no visualization of the joint spaces. There was deformity of both condylar regions with what appeared to be bony union between the condyles and the fossae. The fossae, themselves, appeared to be slightly deformed and were more evident on the right side than on the left. There was considerable bony density in the region of the temporomandibular joints (Fig. 2). There was also evidence of previous bilateral surgical osteotomies of the mandibular rami.

The child was scheduled for bilateral ostectomies of the rami in order to form pseudarthroses. The surgical procedures were planned six weeks apart to prevent a bony union at the ostectomy sites. Ostectomy of the right ascending ramus was performed on January 19. Antibiotic therapy was instituted with procaine penicillin 300,000 units, and streptomycin 0.5 Gm. twice daily.

SURGICAL PROCEDURE—After preoperative medication with pentobarbital, 90 mg., initially, followed one hour later with morphine sulfate 8.0 mg. and scopolamine 0.3 mg., the child was taken to the operating suite.

A no. 5 Magill nasoendotracheal tube was passed blindly on the second attempt, after adequate cocainization of the nose and throat. Induction was begun with 4 cc. of 2.5 per cent thiopental sodium, and anesthesia was maintained using a semiclosed system with ether, nitrous oxide and oxygen. After the skin over the right side of the mandible and the right preauricular region was prepared routinely with pHisoHex and tincture of nitromersol, the patient was draped. In the area of the prior procedure at the angle of the right side of the mandible, 2 per cent lidocaine hydrochloride with 1:50,000 epinephrine was infiltrated for hemostasis.

The scar of the previous operation, which had been performed through a Risdon-type approach, was excised, and the incision was lengthened to 6 cm. Skin, subcutaneous tissue, platysma, and superficial fascia were incised and separated. The external maxillary artery

and the anterior facial vein were identified and then sectioned and ligated. Masseteric insertions along the inferior border of the mandible were visualized and separated, and the body of the muscle was dissected from the ascending ramus by periosteal elevation. Reflection of this muscle was carried superiorly to expose the sigmoid notch and the subcondylar region. It was noted at this time that the fossa was filled completely with bone, and the condylar configuration was obliterated. The horizontal line representing the prior osteotomy was noted by the irregularities along the line of healing.

A small circular diamond stone was mounted in a straight dental handpiece, and a cut was made across the ascending ramus immediately superior to the lingula. The inferior alveolar nerve, artery and vein were identified and left intact. Bone for a distance of approximately 1 cm. was removed superior to the lingula. The bony ends were rounded and contoured inferiorly, and the bone, superiorly, was cut away in an effort to provide a curved path in the form of a shallow fossa.

The diffuse bleeding from the external pterygoid muscle was controlled with Gelfoam packs saturated with thrombin. All other bleeding was controlled by clamping and tying with no. 000 plain catgut. The region was irrigated liberally with sterile normal saline solution in order to remove any bony residuum remaining from the cutting process. The masseter muscle was returned to its original position and was sutured in place with no. 00 chromic atraumatic suture.

The subcutaneous tissues were reapproximated with no. 0000 chromic suture, and the skin margins were closed with no. 0000 plain atraumatic catgut and a continuous subcuticular stitch. Xeroform gauze and a sterile dry dressing were applied and maintained in place by a pressure dressing. The fluids lost during the surgical procedure had been replaced by 250 cc. of whole blood and 300 cc. of 5 per cent dextrose and water through an intravenous infusion. The patient was kept in the operating room until she was recovering from the anesthesia and the nasoendotracheal tube was retained in place. The child was returned to her bed in the ward.

A Levine tube, which had been passed before leaving the operating room, was used to aspirate the gastric juices of the stomach in order to prevent postanesthetic vomiting or aspiration of fluids into the lungs. The child received a total liquid diet, beginning on the first postoperative day. The antibiotic therapy which had been started preoperatively was continued. Codeine sulfate, 8. mg., was prescribed for pain, and elixir of phenobarbital, 15 cc., for restlessness.

POSTOPERATIVE CONDITION — The child's condition on the first postoperative day was satisfactory, with all vital signs within normal limits except for the temperature which rose to 100.9° F. The temperature returned to normal on the third postoperative day without additional therapy. On the fourth postoperative day, there was considerable generalized edema of the right side of the face, which, after the removal of the pressure dressing, subsided by the sixth day.

The patient, being entirely asymptomatic, was discharged from an inpatient status on the seventh postoperative day. All postoperative medications were discontinued at this time, and the patient's mother was instructed to return with the child for the second procedure during March 1956.

SECOND OPERATION—The child was readmitted to the hospital on March 14, approximately six weeks after her previous discharge. During this interim period, the general physical status had remained unchanged, and routine examinations and laboratory procedures on admission were again within normal limits. Oral examination failed to reveal any changes in the position or function of the mandible; however, the child complained of pain in the region of the lower right first permanent molar. This pain was presumed to be the result of deep caries in this tooth. Preanesthetic evaluation was obtained again, and the child was scheduled for surgery on March 16. Antibiotic therapy was instituted again, with procaine penicillin 300,-

000 units and streptomycin 0.5 Gm. twice daily.

SURGICAL PROCEDURE—Premedication with pentobarbital, 90 mg., initially, and one hour later morphine sulfate, 5.0 mg., and scopolamine, 0.3 mg., were administered, and the patient was taken to the operating suite.

Nasoendotracheal, blind intubation was repeated, as before. Anesthesia was induced using 6 cc. of 2.5 per cent thiopental sodium, and was maintained with ether, nitrous oxide, and oxygen. After the same routine preparation of the skin, the field was draped. A Risdon-type incision, 4.5 cm. in length, was made in an elliptical manner in order to excise the prior scar, and sharp dissection was carried down to the masseter muscle.

By combined sharp and blunt dissection the muscle was detached from the angle to the sigmoid notch of the ascending ramus. The external maxillary artery and anterior facial vein were visualized, but were not sacrificed. The site of the previous ostectomy was noted, and examination revealed the glenoid fossa was completely filled with bone and the condyle was indistinguishable.

With large fissure burs, and a small ovoid vulcanite bur in a dental handpiece, the bone was transected above the level of the sigmoid notch as high as possible across the neck of the condyloid process. An attempt was made to readapt this distal surface as a condylar eminence. The ovoid bur was used to hollow out the inferior surface of the fossa so as to provide a concavity into which the convexly prepared neck could move. The space was increased to approximately 3.5 mm.

During this procedure, profuse oozing was encountered from the external pterygoid muscle as its attachments to this bony mass were separated. This was controlled by multiple, stick-tie sutures with no. 000 black silk. In spite of the fact that the condylar neck had been completely freed of its bony attachments to the fossa, it was still practically impossible to open the mouth more than a few millimeters. Therefore the fibers of the temporal muscle were freed from the coronoid process and the ascending ramus. The coronoid process was exposed, and an ovoid bur was used to reduce its height.

There was an immediate improvement in the amount of opening possible, and there appeared to be no restriction of the movement on the left side at this time. It was now possible to insert one finger between the occlusal surfaces of the posterior teeth. All bony margins were carefully smoothed with files, and the usual surgical toilet of the wound was performed.

Hemostatic packs of Gelfoam and thrombin were introduced into the bony cavity and beneath the masseter muscle. The field being dry and clean, the subcutaneous tissues were reapproximated with interrupted no. 000 plain, atraumatic catgut and the skin was closed with continuous no. 0000 plain, atraumatic, subcuticular suture. Xeroform gauze and a dry, sterile dressing were applied beneath a pressure dressing. Since it could not be estimated how much retrusion of the mandible might be expected postoperatively, Ivy loops were placed in each bicuspid region and both permanent and deciduous teeth were utilized so that light elastic traction could be applied to prevent further retraction of the mandible.

The lower right first permanent molar was removed because of the complete carious involvement of the crown which precluded any possible restorative procedure. During the procedure the patient lost approximately 350 cc. of blood which was replaced in the operating room with 500 cc. of preserved whole blood in addition to approximately 150 cc. of 5 per cent dextrose and water infusion intravenously.

The patient tolerated the procedure without difficulty, and at the conclusion of this procedure her vital signs were within normal limits, and the patient fully recovered from the anesthesia while still on the table. The nasoendotracheal tube was retained in place until the return of the child to the recovery ward.

POSTOPERATIVE CONDITION—After the patient's immediate anesthetic recovery, it was possible for her to open her jaw to nearly 2 cm., and because this opening was possible, the nasoendotracheal tube which had been retained after the first procedure until the child had

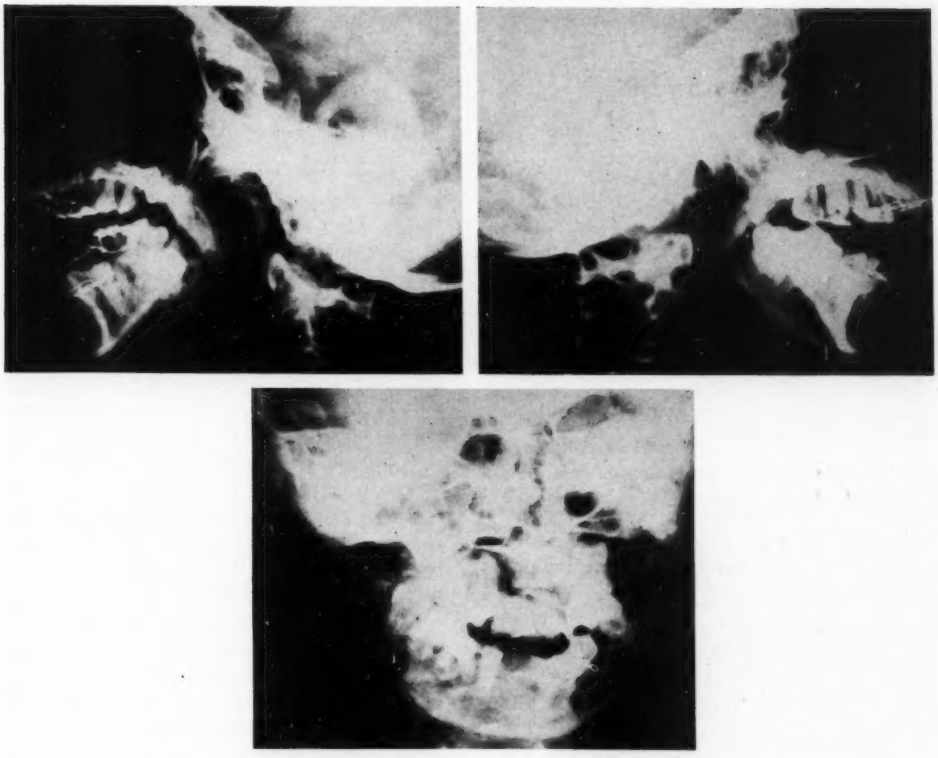


Fig. 3—Postoperative roentgenograms showing bilateral pseudarthroses

pulled it out herself, was removed and necessary suctioning was carried out orally. The patient received the same antibiotic therapy postoperatively which had been started preoperatively, as well as codeine sulfate, 30.0 mg., for pain, and a liquid diet for the first 24 hours. The patient tolerated this regimen well, and during the next 24 hours had no acute complaints regarding her mandible. The novelty of the situation was such that she proceeded to find and eat anything edible.

The postoperative edema was moderate, and the site of incision was healing normally until the fifth postoperative day when approximately one-half ounce of serum and small clots were noted on the dressing at the inferior pole of the incision. On the sixth postoperative day there appeared to be moderate serous drainage from the wound which was cultured immediately and reported as negative for pathogens. A dry, sterile dressing was reapplied, and at this time there were no other clinical findings of note.

Since financial and travel conditions prohibited the mother and child from remaining in the region for a longer period of time, the child was discharged from an inpatient status and permitted to return to her home to be followed as an outpatient under suitably prearranged plans.

The general condition of the patient, on her release from the hospital on the eighth postoperative day, was good except for a mild serous discharge from the inferior pole of the

Fig. 4—Postoperative view showing amount the mouth could be opened

incision. It was possible for her to open her mouth to at least 2.5 cm., and it had not been necessary to utilize the Ivy loops for anterior, elastic traction since she failed to demonstrate any noticeable degree of mandibular retrusion. The patient was able to tolerate also the mastication of a regular diet in most aspects at this time, and appeared most pleased at her ability to open her mouth.

Final roentgenographic examination was accomplished during her last hospital day (Fig. 3).

From the date of the patient's discharge from the hospital and her return to her home, no information regarding the postoperative course of this patient was received until June 15. This letter, quoted in part below, is self-explanatory and indicates the progress of the patient. "We did see an orthodontist and also the doctors at the Naval Hospital that had seen her previous to her operation. The orthodontist said her occlusion was very good and that it was the most successful operation of this kind he has ever seen. He will begin her work in July. Gail's face looks wonderful and she is beginning to get a chin. She has lost six pounds but can eat and chew her food so much better . . ." (Fig. 4).

SUMMARY—Traumatic maxillofacial injuries of children present management problems which, if not solved during the earliest phases of treatment, often result in a proportionately greater resultant deformity than would ordinarily be found under the same circumstances in the adult.

Where such injuries involve growth centers, such growth and repair occurring simultaneously may predispose to physiologic alterations of both growth and repair processes.

Bilateral ankylosis after untreated bilateral subcondylar fractures in a child of 11 years of age is an example of such an alteration of the growth and reparative processes. In this instance, there were untreated bilateral subcondylar fractures with resulting bilateral ankylosis.

Osteotomies to relieve this condition had been performed two years earlier without success. Since at the previous intervention, both sides had been operated on simultaneously, it was concluded that instead of the formation of pseudarthroses as hoped, union of the osteotomy sites had occurred.

Bilateral ostectomies, spaced six weeks apart, were performed. The results of this procedure permitted mandibular movement and a resumption of normal masticatory function.

Because this child's home was at such a distance from the hospital that follow-up procedures would pose an undue financial and travel burden on the parents, postoperative follow-up progress by the authors has not been feasible or possible; therefore, reports of her progress in this respect have been forwarded by the mother.

Sinusoidal aneurysm of the mandible: *report of case*

■ *Sanford M. Moose, D.D.S., San Francisco*

The patient, a boy aged 13 in an apparently good state of health, was referred by his physician who provided the following history: "The patient was first seen on September 8 with a history of bleeding from the right side of his lower jaw between the bicuspid and first molar teeth. The bleeding had occurred spontaneously a few days previously and at times was spurting in type. There was no history of trauma, pain or swelling in the mouth. A few months ago the patient had received a dental examination. The results of the examination were reported as normal. The previous history regarding his health was noncontributory. Blood studies were obtained and showed no alterations with the exception that the hemoglobin was depressed to 9.8 Gm. and the red blood cell count was 3,100,000. The bleeding recurred at short intervals, and on September 14 the patient received a transfusion of one pint of blood. The last bleeding episode was on the morning of September 14.

"Roentgenograms of the mandible were also obtained and were reported to show some pathologic condition in the bony structure of the mandible, the origin and explanation of which is not quite clear to the radiologists."

When the patient was admitted to my office on September 20, he was in apparently excellent health. He had no complaint of pain or any other objective symptoms, except for the history of recurrent spontaneous bleeding. His mother reported that on two or three occasions she had come into his room during the night or in the morning and found a pool of blood on his pillow.

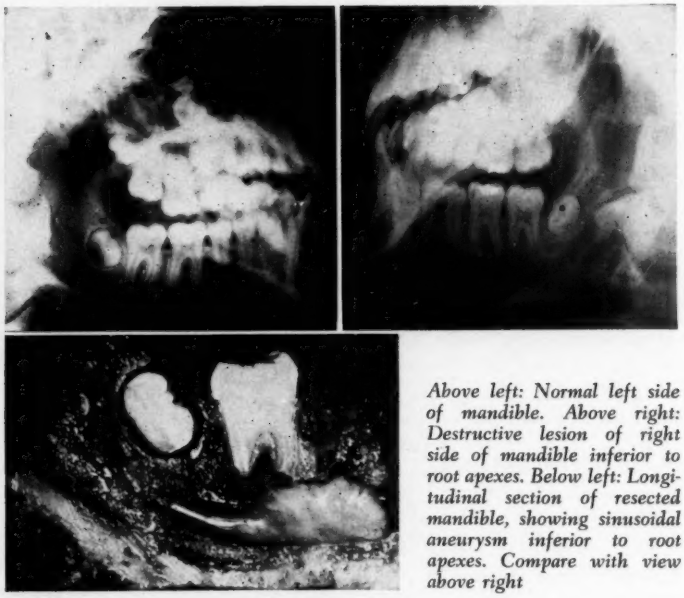
EXAMINATION—Clinical examination of his mouth revealed no evidence of any hemorrhagic areas or any swollen or proliferated interproximal or gingival tissue.

Roentgenograms (see illustration, above) revealed an obvious rarefied area extending from the first bicuspid to the angle of the jaw inferior to the roots of the teeth on the right side. Although a pathologic process was obvious, the rarefaction suggested the possibility of any one of several types of destructive lesions which invade the mandible.

COURSE—Biopsy of the lesion was decided on to establish a correct diagnosis. This was attempted under local anesthesia by the removal of the first molar. As soon as the tooth had been elevated from the alveolus, an overwhelming hemorrhage occurred from the extraction site. It was of such alarming proportions that it was extremely difficult to control by local application of pressure. This of course made it impossible to examine anything within the wound or to obtain a specimen for biopsy. It was apparent immediately that it would be impossible to make any kind of surgical examination without first ligating the blood supply to the jaw.

The patient was immediately admitted to the hospital where his blood was typed and crossmatched, and he was prepared for transfusion and surgery that evening. It was feared that another spontaneous hemorrhage during the night might have a fatal termination.

With the consultation and assistance of Dr. Henry Brown, chief of the surgical service, it was elected to ligate the external carotid artery. That evening under endotrachael anesthesia the external carotid artery was ligated. At the conclusion of this procedure, feeling certain that the normal arterial blood supply to the mandible had been reduced, I now felt



Above left: Normal left side of mandible. Above right: Destructive lesion of right side of mandible inferior to root apexes. Below left: Longitudinal section of resected mandible, showing sinusoidal aneurysm inferior to root apexes. Compare with view above right

it safe to remove the pack which had controlled the hemorrhage previously, since this would allow access to obtain a biopsy specimen. When the pack was lifted from the surgical defect, a hemorrhage promptly recurred with just as much pressure and volume as before the external carotid artery had been ligated. There was no diminution in volume and pressure. Pressure packs were again applied into the bony defect and simultaneously a blood transfusion was begun.

It was then realized that there was some anomalous arteriovenous aneurysm or angioma within the mandible. It therefore seemed obvious that there was no other way to approach the problem less radical than resection of that portion of the jaw. This, of course, was viewed as a procedure of last resort since the external carotid artery had already been ligated without effect. Since it was impossible to tell where the blood supply was coming from, it appeared that the only rational method of approach was to expose the mandible extraorally from below and to ligate any vessels that were encountered in the dissection.

Before resorting to this procedure an additional consultant, Dr. Robert Pollock, was engaged to obtain his opinion regarding any possible conservative treatment short of resection of the mandible. The volume and overwhelming nature of the previous hemorrhages did not permit time for delay since the packing conceivably could be forced out of position with another subsequent hemorrhage that might terminate fatally. After deliberating with the two consultants it was concluded that the life of the child was the first consideration and it was agreed that there was no other way of approaching this bleeding problem without a resection of the involved portion of the jaw. The resection was accomplished on the following afternoon.

Because of the excessive hemorrhage and the difficulty of controlling all the contributing vessels, it was impossible to identify the source of the arteriovenous aneurysm. It was elected to avoid disarticulation of the condylar portion of the ramus, since it did not appear to be involved and it would be valuable in subsequent reconstruction of the jaw. The mandible was

sectioned just posterior to the cuspid and superior to the mandibular foramen on the right side. The section of the mandible that was removed was sectioned longitudinally and contained a large aneurysm (see illustration, below). The tentative clinical diagnosis, pending the pathologist's confirmation, was arteriovenous aneurysm within the body of the right mandible.

HISTOPATHOLOGIC REPORT—John Young, oral pathologist, College of Physicians and Surgeons, reported as follows:

"The part of the resected mandible bearing the lower second bicuspid and second molar teeth was embedded in paraffin, sectioned at 15 microns and the mounted sections were stained with Delafield's hematoxylin and eosin.

"Under the microscope the large space beneath the apex of the tooth is seen to be lined by an endothelium supported by a meager network of reticular fibers. A few other rather large, thin walled vascular channels are observed in the adjacent cancellous bone. Just inferior to this large vascular space, loose areolar connective tissue invests the mandibular artery, vein and nerve.

"The large space is apparently sinusoidal in nature so that a diagnosis of sinusoidal aneurysm of the mandible seems logical."—*450 Sutter Street.*

Eosinophilic granuloma of bone: *report of case*

■ *Theodore H. Dedolph, Jr., D.D.S.; Anand P. Chaudhry, B.D.S., Ph.D., Minneapolis, and David F. Mitchell,* D.D.S., Ph.D., Indianapolis*

Eosinophilic granuloma was first described as an independent entity in 1940 by Otani and Ehrlich[1] and Lichtenstein and Jaffe.[2] Farber[3] and Mallory[4] were concerned with this disease in the years immediately thereafter. Sleeper[5] has furnished an extensive review of the literature in more recent years.

This is a relatively benign disease with localized, single or multiple lesions occurring most commonly in the second or third decades of life. It is regarded as being closely related to Letterer-Siwe and Hand-Schüller-Christian disease and is believed to represent only a difference in degree and progress of the same basic underlying disorder. The older theory that these diseases are primarily a disturbance of lipoid metabolism is abandoned in favor of one which considers them to be a primary disturbance of the reticuloendothelial system with a secondary storage defect of lipoid.

Letterer-Siwe disease is acute, rapidly progressive and invariably fatal and occurs chiefly in infants up to two years of age. Hand-Schüller-Christian disease most often occurs in children from two to seven years of age and pursues a prolonged course. The prognosis is rather favorable as compared to that of Letterer-Siwe disease. Eosinophilic granuloma occurs in young

From the University of Minnesota School of Dentistry.

*At present, Indiana University School of Dentistry, Indianapolis.

1. Otani, S., and Ehrlich, J. C. Solitary granuloma of bone simulating primary neoplasm. Am. J. Path. 16:479 July 1940.

2. Lichtenstein, L., and Jaffe, H. L. Eosinophilic granuloma of bone, with report of case. Am. J. Path. 16:595 Sept. 1940.

3. Farber, S. Nature of "solitary or eosinophilic granuloma" of bone. Am. J. Path. 17:625, 1941.

4. Mallory, T. B. Medical progress; pathology, diseases of bone. New England J. Med. 227:995 Dec. 17, 1942.

5. Sleeper, E. L. Eosinophilic granuloma of bone. Oral Surg., Oral Med. & Oral Path. 4:896 July 1951.

Fig. 1—Note large, well-demarcated radiolucent area in region of angle of mandible

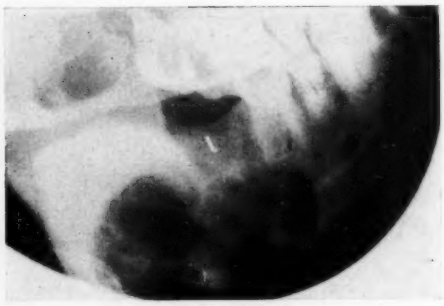


Fig. 2—Radiolucent area has increased in size and has taken on a multilocular appearance

persons during their second and third decades. Prognosis of the disease is good; however, the condition should be guarded since the possibility of its developing into Hand-Schüller-Christian disease exists.

The treatment of the latter two diseases may be roentgen ray therapy, curettage, or both. There have been reported cases of eosinophilic granuloma which healed spontaneously.

REPORT OF CASE—A twenty year old white man was referred to the School of Dentistry on August 13, 1954, with a chief complaint of swelling of his right cheek. His illness dated back to November 1952, at which time he had felt occasional pain along the inferior border of the right side of the mandible. The pain was dull and intermittent. The patient had not consulted any physician or dentist until November 1953, at which time the pain had increased in intensity and there was noticeable swelling of his right cheek. In February 1954, his dentist had extracted the right mandibular and maxillary third molars; after the extractions there was regression but not complete relief of signs and symptoms. Three weeks after the extractions, the patient was referred to an oral surgeon who removed tissue for biopsy from the unhealed third molar socket.

The tissue was composed of granulation tissue with occasional eosinophil cells. No conclusive diagnosis could be established. A roentgenogram at that time (Fig. 1) revealed a definite area of bone destruction, with well-defined outline but with no apparent reaction of the surrounding bone. A tentative diagnosis of fibrous dysplasia, hyperparathyroidism or eosinophilic granuloma was made.

Since the patient felt considerably better, he did not return to the office of the oral surgeon for six months. He then was referred to the dental school for further evaluation.

The past and the family history of the patient were noncontributory.

Physical examination revealed a well-developed, rather obese 20 year old white man who was in no acute distress, but whose right cheek was considerably swollen. The swelling appeared to be noninflammatory in nature and extended from the tragus of the right ear to the submandibular region. It was firm, nontender and nonfluctuant. Intraoral examination showed bulging of the buccal cortex of the mandible. The sites of previous extractions had healed normally.

Roentgenograms made at this time (Fig. 2) revealed a multiloculated cystic lesion involving the body and part of the ramus of the mandible. There was no evidence of pathologic fracture. There was indication of regeneration of bone in some parts of the radiolucent area.

At this visit, another biopsy specimen was taken through the buccal cortical plate. The tissue was characterized by considerable fibroblastic activity and new bone formation. The bulk of this tissue was composed of chronic

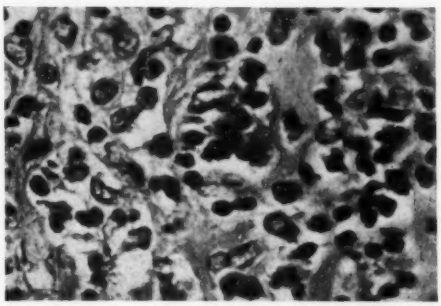


Fig. 3—Fat-filled macrophages, lymphocytes and occasional eosinophils with their characteristic granular cytoplasm are seen

inflammatory cells and a few eosinophil cells. The slide was reviewed by several pathologists, but again no definite diagnosis could be established except that the benignity of the lesion was unquestionable.

The patient was referred to the University Hospital for complete physical examination and treatment. The results of laboratory studies were found to be within normal limits. The patient was taken to the operating room on September 30. Under general anesthesia, the mucoperiosteum and the masseter muscle fibers were stripped away from the mandible. With the osteotome and mallet the cortical buccal plate was removed and the cavity completely curetted and packed with 10 per cent Formalin for a few minutes to destroy the traces of tumor cells. The cavity was then irrigated with saline solution and packed lightly with petroleum jelly gauze. The postoperative recovery was uneventful and the patient was discharged October 4.

Histologic examination of the tissue (Fig. 3) revealed small pieces of fibrous tissue and necrotic material. There were broad sheets of large cells resembling macrophages, and interspersed, numerous eosinophils. The definitive diagnosis of eosinophilic granuloma was made from this specimen.

The patient was readmitted to the University Hospital on August 2, 1955, with a chief complaint of painful swelling over the anteromedial aspect of the middle one third of the left femur for the last two months. Roentgenographic examination revealed an osteolytic lesion in the cortex with periosteal proliferation. Under general anesthesia the bone was cleared of the tissue and the cavity was saucerized. The postoperative course was normal and uneventful.

The tissue was composed of cells which were arranged in a compact syncytium. Throughout the lesion there was present a sprinkling of eosinophils which were rather numerous in some parts. The diagnosis of eosinophilic granuloma was made. The patient has been under observation since then, and there is no evidence of other lesions appearing elsewhere in the body as of May 1956.

DISCUSSION—This case illustrates the difficulty a pathologist encounters in making a histologic diagnosis of this lesion because the histologic findings are so variable. In the early stages, the tissue may consist primarily of inflammatory cells. At later stages, the lesion is characterized by broad sheets of macrophages with or without lipoid contents. The presence of eosinophils is variable, and they are not considered necessary for the diagnosis.

■ Art and Science

Art and science, if they are to be reckoned as two of the great values of life, must teach humility, tolerance, wisdom and magnanimity. The values of art and science are not beauty, but right action and truth. The sermons of artists and scientists are more efficacious if they have no notion that they are preaching one.—*W. Somerset Maugham. The Summing Up.*

Gingival cyst: *report of case*

■ *David J. Kennedy, D.D.S., Syracuse, N. Y.*

Few gingival cysts have been reported. Ritchey and Orban[1] described six cases of gingival cysts. Bhaskar and Laskin[2] reported three clinically and roentgenographically discernible lesions in the attached gingiva.

Perhaps other lesions have been overlooked because the assumption was made that the mass represented a low grade, localized abscess associated with an adjacent tooth.

REPORT OF CASE—A slightly built, 30 year old white man was referred by his dentist for diagnosis of a mass of the left maxillary gingiva. There were no symptoms, and there was no record of duration of the lesion. The patient had been oblivious to its presence. Examination revealed a small, bluish mass of the gingiva, ¼ inch in diameter, between the maxillary left second bicuspid and first molar (see illustration). It was nontender and slightly fluctuant. Pulp testing and roentgenograms of the adjacent teeth were negative. The rest of the mouth was normal.

Two years previously a radicular cyst had been removed from the apex of the maxillary left central and lateral incisors, and root canal therapy and root amputation had been carried out. Several years previously a lesion had been removed from the patient's cheek and had been diagnosed as basal cell carcinoma. The rest of the medical history was not significant.

Under local anesthesia a flap was elevated revealing a small cyst, 3/16 inch, containing clear fluid. It was separated from the mucosa and removed. A depression between the second bicuspid and first molar was observed where the cyst had resorbed alveolar bone. No fistulous tract could be found leading into the alveolar bone.

The specimen was examined microscopically and was reported as follows: "epithelial inclusion cyst of the gingiva."

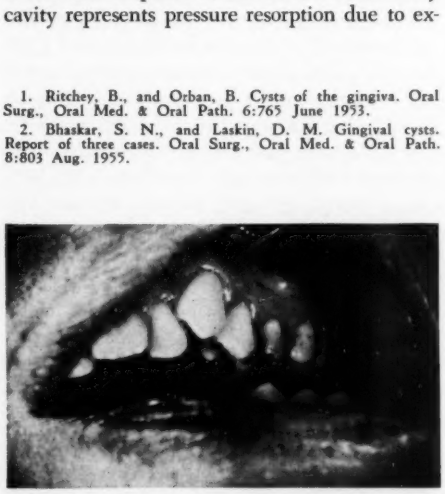
DISCUSSION—Ritchey and Orban[1] list the following etiologic possibilities for gingival cyst formation:

1. Heterotopic gland tissue.
2. Remnants of the dental lamina, enamel organ or epithelial islands of the periodontal membrane.
3. Degenerative changes in a proliferation from an epithelial peg.
4. Traumatic implantations of displaced oral epithelium.

Ritchey, Orban, Bhaskar and Laskin seem to believe that the latter possibility is the most likely.

Apparently the majority of gingival cysts do not exhibit clinical manifestation of their presence. In two out of three cases reported by Bhaskar and Laskin[2] there was a bone cavity suggesting the possibility of an alveolar origin. It was their impression, however, that the bony cavity represents pressure resorption due to ex-

1. Ritchey, B., and Orban, B. Cysts of the gingiva. Oral Surg., Oral Med. & Oral Path. 6:765 June 1953.
2. Bhaskar, S. N., and Laskin, D. M. Gingival cysts. Report of three cases. Oral Surg., Oral Med. & Oral Path. 8:803 Aug. 1955.



View of left maxilla showing gingival mass

pansion of a cystic mass of gingival origin. The case I have reported would seem to fall into the same category. Where bone loss is noted in roentgenograms of suspected gingival cysts, it is wise to rule out first the more probable possibilities of periapical or periodontal pathologic conditions, mental foramens, and median cysts.

SUMMARY—Gingival cysts that exhibit clinical manifestations are rare. It is probable that some are overlooked because they are symptomless. The case reported was discovered during a routine dental examination. The exact etiology of these lesions is still unknown.—*407-409 University Avenue.*

Fibrolipoma of the mandible: *report of case*

■ *C. W. Newman, D.D.S., M.S., Indianapolis*

The patient, a 65 year old white man, was admitted to the hospital on March 4, 1955, for psychiatric treatment.

EXAMINATION—Physical examination revealed a well developed man who was somewhat obese but essentially normal for his age group. The routine dental roentgenographic examination showed generalized alveolar bone loss, a retained root in the lower left first bicuspid area, and an unerupted lower right third molar.

A lateral view of the mandible (Fig. 1, left) was obtained on March 31 which showed all of the unerupted tooth. This film also revealed a rarefied area 15 mm. in diameter at the inferior border of the right side of the mandible inferior to but not connected with the impacted tooth.

At the time of admission, the urinalysis was within normal limits. The hemogram showed 10,800 leukocytes with a normal differential count and hemoglobin 15.5 Gm. per hundred milliliters. Sedimentation rate was 35, bleeding time 2.5 minutes and coagulation time 6 minutes.

COURSE—The patient showed sufficient improvement in his psychiatric condition so that on March 31 the retained root was removed under local anesthesia, and on April 14 the unerupted lower third molar was removed. On May 3 the lesion at the inferior border of the right side of the mandible, which was thought to be a solitary cyst, was removed under general anesthesia administered by endotracheal intubation.

OPERATION—The patient was prepared and draped in the usual manner. An incision was made along the inferior border of the mandible on the right side extending approximately 5 cm. anterior to the gonion. The anterior facial vein and facial artery were contacted and tied with no. 000 silk sutures and sectioned.

The bone was contacted and the lesion noted just anterior to and deep to the masseter muscle; it extended upward from the inferior border.

The lateral plate of the mandible, which was friable, was opened with a chisel and the edges of the bone saucerized with rongeur forceps.

A soft, circular fatlike pad was encountered in the spongy part of the mandible, and on further exploration it was discovered that the medial plate on the mandible had been entirely destroyed and replaced by soft, fibrous tissue. The flat, round, soft mass was removed

Chief, dental service, Veterans Administration Hospital.

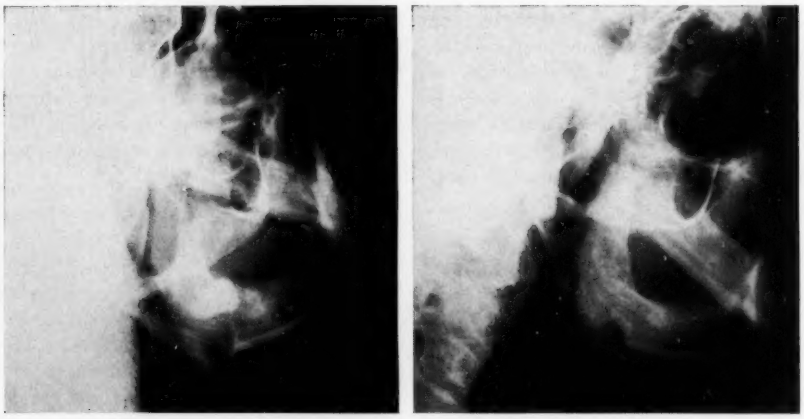


Fig. 1—Left: View of mandible taken March 31, 1955. Right: View taken June 7, 1956

in pieces with a curet and was sent to the laboratory for histologic study. The wound was closed in the usual fashion. The incision healed normally and the sutures were removed in seven days. Roentgenograms taken on June 7, 1956, over a year later (Fig. 1, right), showed the radiolucent area of the mandible to have filled in to some degree.

Paraffin sections stained with hematoxylin and eosin showed that the specimen of tissue consisted of mature fatty tissue and some collagenous tissue. There were a few leukocytes, but the inflammatory changes were not considered significant. The diagnosis was fibrolipoma of the mandible (Fig. 2).

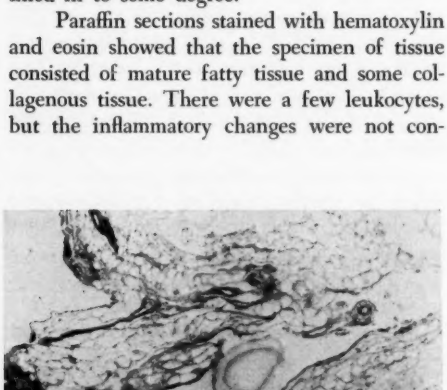


Fig. 2—Section showing mature fatty tissue, some collagenous tissue, and a few lymphocytes

DISCUSSION—According to MacCallum,[1] lipomas are fairly common tumors throughout the soft parts of the body; however, there appear to be few such tumors within bones. Dickson[2] reports a true lipoma of the tibia. Lichtenstein,[3] in discussing tumors of fat cell origin, states that although theoretically the development of a lipoma within the fatty marrow of bone should occasion no surprise, for some reason such tumors are so rare that he had never encountered one.

Oringer[4] reported an instance in which the frozen section of tumor removed from the region below the lower left second molar showed areolar connective tissue with a great number of lipoid cells present. He also stated that grossly the tumor was slick and greasy to the touch. Mead[5] mentions two instances of lipoma of the maxilla that he had treated.

1. MacCallum, W. G. Textbook of pathology, ed. 7. Philadelphia, W. B. Saunders Co., 1936, p. 1058.
2. Dickson, A. B., and others. Lipoma of bone of intraosseous origin. J. Bone & Joint Surg. 33A:257 Jan. 1951.
3. Lichtenstein, Louis. Tumor bones. St. Louis, C. V. Mosby Co., 1952, p. 24.
4. Oringer, M. J. Lipoma of mandible. Oral Surg., Oral Med. & Oral Path. 1:1134 Dec. 1948.
5. Mead, S. V. Oral surgery, ed. 3. St. Louis, C. V. Mosby Co., 1946, p. 1213.

Traumatic (amputation) neuroma
report of case

■ *William G. Shafer, D.D.S., M.S., and*
Wilbur C. Moorman, D.D.S., M.S., LL.B., Indianapolis

The term "neuroma" implies a new growth arising from tissue of nervous origin, either nerve cells or nerve fibers. The specific lesion known as the amputation or traumatic (post-traumatic) neuroma is not a true neoplasm, but represents merely an exuberant attempt at repair of a nerve that has been injured by trauma. It is essentially a hyperplasia of nerve fibers and their investing tissues.

The process of degeneration and regeneration of peripheral nerves after injury is a fascinating one and incompletely understood. When nerve fibers are severed, degeneration of the distal portion occurs. The degeneration begins as a swelling, fragmentation, and disintegration of axis cylinders and the myelin sheaths. Removal of this tissue debris is accomplished by macrophages mobilized from the surrounding connective tissue. The neurilemmal sheaths or tubes gradually shrink in size until the degenerated fibers distal to the injury consist only of strands of connective tissue and neurilemma. The nerve does not disappear completely.

Repair begins with proliferation of the axis cylinders, the cells of the neurilemmal sheaths and the endoneurium. The persistence of the neurilemmal tubes greatly facilitates regeneration, since it is through these that the new fiber proliferates and around them that the lemmocytes or Schwann cells multiply. Ultimately, reinnervation usually occurs unless the proliferating proximal end meets some obstruction such as dense scar tissue, a foreign body, or, in the case of the inferior alveolar nerve, a malalignment of the mandibular canal after a fracture of the mandible. In such instances, the nerve may continue to proliferate at the site of the obstruction into an unorganized bulbous or nodular mass of nerve fibers and Schwann cells: the traumatic neuroma. These lesions are relatively slow-growing and may be painful on pressure. Since a variable amount of hemorrhage and formation of granulation tissue and subsequent scar tissue may occur in the area of initial injury to the nerve, the histologic appearance of the traumatic neuroma is somewhat protean. Thus, some such lesions may consist almost entirely of a tangled mass of nerve fibers with very little supporting tissue while others exhibit such a preponderance of connective tissue that the nervous element is nearly obliterated.

■ *Report of Case*

A 50 year old white woman was seen at the Indiana University Dental Clinic. Her chief complaint was of pain in the edentulous right mandibular molar region as well as submaxillary tenderness and slight soreness at the anterior border of the ramus. The patient stated that approximately 14 years previously she had suffered a fracture of the mandible during the removal of a molar tooth. After this episode the patient was aware of pain in her jaw and stated that the "nerve in the jaw-bone" had been cut to alleviate this pain. This had resulted in permanent anesthesia of the region supplied by the inferior alveolar and mental nerve. For several years prior to admission, she had had a chronic headache.

Intraoral examination revealed a small, nodular, hyperplastic mass of tissue measuring approximately 0.5 cm. by 1.5 cm. situated in the retromolar region of the ascending ramus of the mandible (Fig. 1, left). It was smooth, firm in consistency and of the same color as

From Indiana University School of Dentistry departments of oral pathology and oral surgery.

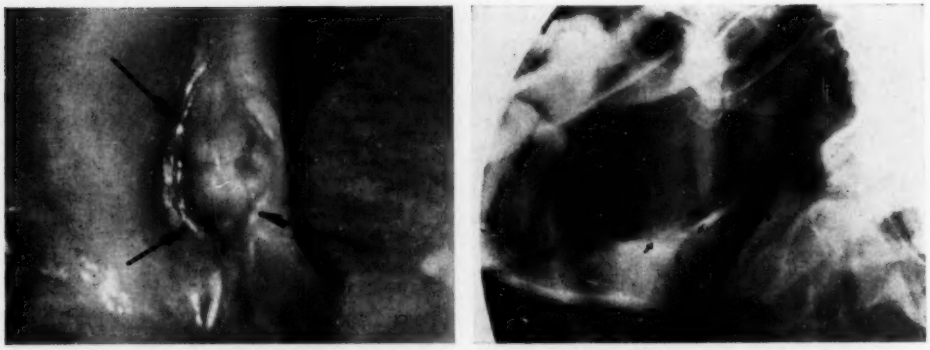


Fig. 1—Left: Nodular appearance of traumatic neuroma in retromolar region of right side of mandible. Right: Mandibular canal appears to pursue unusual course within the ramus and has its aperture in retromolar region associated with nodular mass of tissue seen clinically

the surrounding mucosa. It was painful when manipulated.

Roentgenographic examination revealed that the mandibular canal apparently was continuous with the overlying soft tissue lesion (Fig. 1, right), instead of assuming its normal course within the body of the mandible. The mandibular canal within the body of the mandible appeared to have been completely obliterated by bone.

On the basis of the history, clinical and roentgenographic observations, a provisional diagnosis of traumatic neuroma was made. The lesion was removed under local anesthesia, the underlying nerve avulsed for a distance of about 1 cm., and the end cauterized (Fig. 2).

When the patient returned four days later, the region appeared to be healing satisfactorily.

Fig. 2—Surgical specimen consists of nodular mass of tissue and portion of avulsed inferior alveolar nerve to which it was attached

The patient stated that the ache in her jaw had disappeared as well as her chronic headache.

Histologic examination revealed two pieces of tissue, one composed chiefly of bundles of collagenous fibers interspersed with several large nerve trunks, which represented a portion of the mandibular nerve. The second specimen was composed chiefly of stratified squamous epithelium, subjacent connective tissue and numerous small nerves. The surface epithelium exhibited a mild proliferation of rete pegs in some regions. The underlying connective tissue which made up the bulk of the specimen was composed of interlacing bundles of collagenous fibers liberally interspersed with numerous small nerve fibers. These nerves were scattered diffusely throughout the connective tissue and appeared to exhibit no deviation from the usual structure; there were merely an unusual number present (Fig. 3).

■ *Discussion*

Instances of traumatic neuroma have been reported previously by Cahn,[1] Oringer,[2] Green[3] and Thoma,[4] while Young[5] has published an

1. Cahn, L. R. Traumatic (amputation) neuroma. Am. J. Orthodont. & Oral Surg. 25:190 Feb. 1939.
2. Oringer, M. J. Neuroma of mandible. Oral Surg., Oral Med. & Oral Path. 1:1135 Dec. 1948.
3. Green, H. G. Amputation neuroma. J. Oral Surg. 11:256 July 1953.

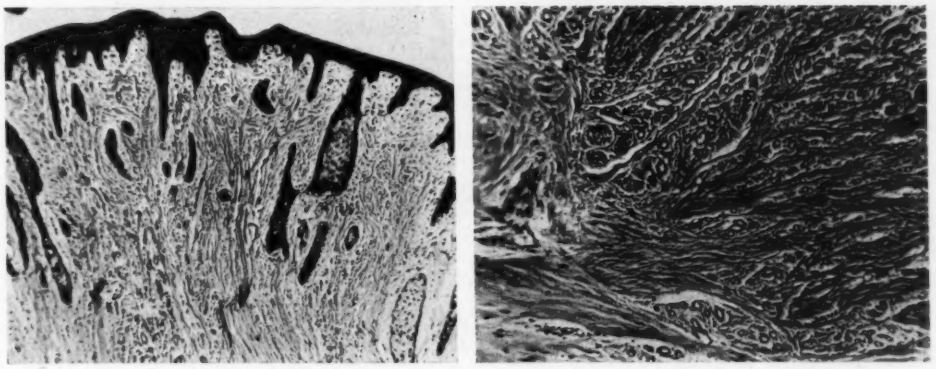


Fig. 3—Left: Low power photomicrograph reveals mild irregular epithelial hyperplasia and fibrous nature of lesion. Right: High power photomicrograph reveals unusual number of small nerves scattered throughout the connective tissue

excellent article on the repair of nervous tissue which includes a discussion of the neuromas. Clinical experience has shown that this lesion is not rare; it is surprising that more instances have not been recorded in the literature.

The traumatic neuroma occurs with some frequency in the region of the mandibular third molar tooth socket. The patient's history usually reveals an extremely traumatic tooth removal which is followed by residual anesthesia of the lower lip on the involved side. This may indicate severe damage to the inferior alveolar branch of the mandibular nerve with the neuroma forming centrally in the mandible or in the region of the tooth socket itself over a prolonged period of time. A similar condition may arise when ostectomy is performed for correction of prognathism and the inferior alveolar nerve is sectioned. Another common site for the development of the traumatic neuroma is in the vicinity of the mental foramen. This neuroma may result from an injury to the mental nerve which occurs usually at the time of extraction of the bicuspids.

This type of lesion also arises in soft tissues as a result of penetrating or incisive injuries which involve nerves. These lesions appear as firm nodules, often in the lip or tongue, which are painful and usually date from some accident in which the patient bit himself severely. Aside from the pain of these lesions, there is nothing particularly characteristic of their clinical features.

The treatment of the traumatic neuroma is a surgical one. They should be excised and, if possible, a portion of the involved nerve avulsed. There is certainly a possibility of recurrence of the lesion, but this is not common.

■ *Summary*

The traumatic neuroma is not a true neoplasm but a hyperplasia of nerve fibers due to exaggerated attempt at repair after injury to a nerve. The lesion may occur centrally within bone, usually after traumatic tooth extraction, or peripherally in the soft tissues after incisive injury of tissue. The treatment is surgical removal with avulsion of a portion of the involved nerve.

4. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 1311.

5. Young, J. Z. Functional repair of nervous tissue. Physiol. Rev. 22:318 Oct. 1942.

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A critical re-evaluation of penicillin

THE INCREASING NUMBER of fatal anaphylactic reactions following the injection of penicillin calls for a re-evaluation of its use in oral surgery. Certainly, any drug that produces such a relatively high rate of serious reactions should be subjected to a critical review, despite the fact that it has been of monumental assistance in the management of serious infections in the past.

Insofar as oral surgery procedures are concerned, penicillin has proved to be one of the most effective of the antibiotics and should be of continuing usefulness for many years to come. It has been remarkably successful in promoting healing by first intention of wounds from extraction of impacted lower third molars, has reduced the morbidity and mortality of deep jaw and neck infections and has immeasurably aided healing after all types of mouth and jaw surgery, thereby contributing greatly to improved results. However, now it must be considered a very dangerous drug when it is injected into patients who have become sensitized to it by previous use.

Fortunately, the oral use of penicillin does not involve the same high proportion of anaphylactic reactions. Anaphylaxis can and does occur when penicillin is given by mouth, but the rate of occurrence is much lower and usually the ensuing reaction is less severe, allowing more time for successful supportive and resuscitative treatment. Penicillin V given orally also has the advantage of being capable of producing therapeutic blood levels equal to those produced by the injected form. It therefore provides relatively safe, effective antibiotic therapy when penicillin is indicated.

It is obvious, therefore, that all oral surgeons should be mindful of the increasing number of patients who are allergic to penicillin and should give serious thought to discontinuing its use by injection, substituting instead, adequate administration of penicillin by mouth. Patients who are to be given the drug in any form should, of course, be carefully questioned regarding past reactions. Any suggestion of a positive allergic response should be regarded as a strict contraindication for its use. In such circumstances, some other antibiotic or combination of antibiotics should be used, the choice preferably to be dictated by bacterial sensitivity tests if adequate cultures can be obtained.

Despite the myriad of other available antibiotics, it is likely that penicillin will continue to play an important role in oral surgery in the foreseeable future. However, because of the increasing danger of a fatal anaphylactic reaction after its injection, it can be safely predicted that its use by injection will be replaced by the less dangerous but equally effective administration by mouth.—*Fred A. Henny.*

■ Extraction of Teeth in the Maxilla

Q.—In the removal of maxillary teeth, is there any order of preference in which the teeth are removed?

A.—The order of sequence in the removal of teeth in multiple extractions in the maxillary region will be dictated by considerations of root formation, tooth position and supporting bone. Regions of alveolar atrophy may make remaining maxillary molars the sole support for the antral floor. The tuberosity of the maxilla is always vulnerable to fracture. In general, if all teeth are present, the cuspids and first molars have priority for initial removal while the adjacent teeth are supporting the alveolar process at the corners of the arch and along the floor of the maxillary sinus. If adjacent teeth are removed first, there is greater vulnerability to fracture of large segments of alveolar process when the long-rooted and well-supported cuspids and first molars are extracted.

■ Lateral Swelling in the Palate

Q.—What are the probable causes for a soft localized painless swelling on the lateral aspect of the palate in the second molar region? The overlying mucosa is normal in color and surface characteristics.

A.—The broad diagnostic categories of possibility are: chronic inflammation, cyst or neoplasm. Clinical and roentgenographic examination should confirm or rule out odontogenic, periapical or periodontal pathologic condition. Aspiration may yield cystic fluid as a diagnostic aid. Further investigation of the swelling in the submucosa through biopsy procedure is essential. Among the more common possibilities of neoplastic processes in this region are fibroma and mixed salivary gland tumors.

■ Location of Incision for Recovery of Retained Roots

Q.—Where should the incision be made for the recovery of a residual root retained in the alveolar process of an otherwise edentulous ridge?

A.—All means for accurate localization with roentgenograms should be employed. Any obvious clinical evidence in inspection and palpation of the overlying mucosa may be helpful in planning the approach. In order to gain maximum access to the region, the incision usually is best made over the crest of the ridge. This approach allows reflection of mucoperiosteal flaps either buccally or lingually without tension.

■ Residual Defect in Cystic Region of the Jaw

Q.—A patient who had a large cyst of the maxilla was treated by a Partsch procedure ten months ago. Within the first six months after the exteriorizing of this process, the dimensions of the cystic cavity reduced 50 per cent. Since that time, the residual cavity has remained dormant and provides a zone for accumulation of fluids and food debris. What further treatment is in order?

A.—It has been our experience that after the initial reduction in the size of cystic cavities with the release of the initial pressure, a long period of relative dormancy follows. After the benefits of the Partsch procedure have been

This section devoted to queries and comments from readers on topics of current interest to oral surgeons and general dental practitioners is edited by James R. Hayward, University Hospital, Ann Arbor, to whom readers are invited to send their communications. The answers, prepared by competent consultants, do not necessarily represent the opinions of any official scientific organization. Your participation in this section is invited.

The Editor.

achieved with restoration of bony walls between the cystic cavity and the nasal cavity and maxillary sinus, further surgery may be indicated to eliminate the residual cyst wall. Intervention for enucleation of the residual epithelial lining is indicated, and should be followed by more rapid bone regeneration in the residual defect.

■ Phlebitis after Injection

Q.—What causes a phlebitis in the arm after an injection of intravenous pentobarbital or secobarbital?

A.—Faulty cleansing of the skin or the use of an unsterile needle could cause a phlebitis in the arm after injection. However, the pH of the barbiturate solution alone could also produce this symptom. This is the usual cause, and the complication can be minimized by: (1) slow injection of the solution, (2) avoiding injection under the pressure of a tourniquet, (3) using a large enough syringe so that an equal quantity of blood can be mixed with the solution before injecting the drug.

■ Pain from Infiltration of Adjacent Tissues by Anesthetic

Q.—How can the pain of an accidental infiltration of adjacent tissues by thiopental sodium during venipuncture be relieved?

A.—Care should be exercised in making the venipuncture to avoid penetrating through the vein and infiltrating adjacent tissues with this drug. However, the immediate pain can be relieved by infiltration into the area with 1 per cent or 2 per cent procaine hydrochloride (Novocain).

■ Unerupted Molars in Extraction of all Teeth

Q.—What should be done about unerupted third molars in the young patient who needs extraction of all teeth because of extensive dental caries?

A.—It is often wise to retain the unerupted third molars, carefully explaining to the patient that they will erupt in due course and probably will have to be removed at a later date. It is well known that the development of alveolar bone is predicated upon the eruption of the teeth. A more fully developed tuberosity is likely to result if the teeth are not extracted, and bone will not have to be sacrificed needlessly. Retention is particularly wise if the unerupted teeth are high in the maxilla. This procedure should aid in the immediate construction of a prosthesis and afford a more favorable future for the denture wearer.

■ General Anesthesia for Epileptic Patients

Q.—Is nitrous oxide-trichloroethylene general anesthesia contraindicated in the epileptic patient?

A.—As a rule epileptic patients respond excellently to general anesthesia. Most of these patients are on some type of sedation, usually barbiturates. It is wise to ascertain if the patient is taking the medication as prescribed by his physician; in most instances, additional premedication of barbiturates will be desirable.

■ Tongue Lacerations

Q.—Is there any contraindication to closure of tongue lacerations by suturing?

A.—On the contrary, there is good reason for careful closure of wounds of the tongue. After hemostasis of bleeding from large vessels has been accomplished and the wound has been cleansed of foreign material, careful suture approximation for restoration of normal contour should be carried out. Because of the mobility of the tongue, the sutures must adequately engage tissue if they are to accomplish their purpose. The excellent blood supply of the tongue will provide survival of tissue which could not be salvaged in many other parts of the body. A careful and adequate closure will minimize scar tissue and deformity of the tongue.

■ With the increase in anaphylactic type reactions to penicillin, it is deemed best in using the drug to make the injection in the arm muscle low enough so that a tourniquet may be applied should a reaction occur. The tourniquet will slow down the absorption of the drug from the region. Additionally, administration of a vasoconstrictor drug in this region might be of some benefit. Other supportive therapy must be instituted immediately.

■ A round no. 8 carbide bur has been found effective in cutting bone during surgical removal of teeth. One must be careful in using this bur on a lateral surface of bone as the rotary motion tends to make it spin away from the bone and engage adjacent soft tissues. The periosteum can be badly torn; the soft tissues should be adequately protected by retracting instruments. Cutting with this bur is best done under a stream of water.

■ An increasing number of patients with coronary heart disease are being carried on continuous anticoagulant therapy. It is usually not necessary to take the patient off this therapy for minor extraction procedures. However, the patient's physician should be consulted, and the prothrombin time ascertained, as some modification in treatment may be necessary if the prothrombin time is found to be considerably prolonged. Sutures and other local hemostatic agents, such as Gelfoam, should be used to prevent unusual bleeding.

■ A small, cylindrical shaped diamond stone with a blunt, rounded metallic end is an effective instrument for smoothing a sharp mylohyoid ridge in the edentulous mouth or correcting a lingual exostosis around a mandibular third molar region. These instruments do not traumatize soft tissue, and a minimal dissection is necessary to accomplish the bone reduction. On the other hand, a tapered antrum bur, which is also effective, may tear the mucoperiosteum. These ridges or exostoses, if left uncorrected, often will erode through the soft tissue as healing progresses and will need further surgical attention.

■ When aiding in the eruption of an impacted palatal cuspid through surgical exposure, it is best to reflect the entire mucoperiosteum over the anterior palate from the free gingival margin along the anterior and bicuspid teeth. This procedure allows adequate exposure for locating the imbedded tooth and facilitates bone removal. After the mucoperiosteal flap is reapproximated and sutured, the electrosurgical knife can be used to effect an opening in the soft tissue over the tooth. This method has the advantage over sharp dissection in that it aids in controlling bleeding. With careful handling of the tissues and preservation of the normal blood supply, there is no danger of sloughing or necrosis of the soft tissue. In working through a small opening, it is frequently difficult to establish normal landmarks and differentiate between bone and tooth structure. Frequently, the roentgenograms may be somewhat misleading and not of much value in locating the crown of the tooth. If a small window is cut first, it may not be directly over the unerupted tooth, and the surgical procedure will be more difficult.

Readers are invited to send their clinical observations to the editor, Fred A. Henny, Henry Ford Hospital, Detroit.

■ CLINICAL DENTAL ROENTGENOLOGY—TECHNIC AND INTERPRETATION. J. O. McCall and S. S. Wald. Fourth edition. 466 pages. Philadelphia, W. B. Saunders Co., 1957.

Chapters on long cone technic, safety measures, the use of the new 90 KVP equipment and technics for temporomandibular articulation roentgenography have been added to bring the fourth edition of this excellent book up-to-date. The book is designed primarily for use as a textbook for dental students but can well serve as a reference for the dental practitioner.

Although the section on safety for dental personnel and patients is a welcome addition, it could be greatly expanded, and the recommendations made more emphatic. The section on ill-effects of radiation is sketchy. The suggestions for proper safety technics in the dental office fail to stress the importance of monitoring the radiation received by the dental personnel as a direct simple means of determining dosage. Since the book was published, the National Bureau of Standards has reduced the maximum permissible dose by 50 per cent, making it necessary to take more stringent protective measures than outlined in this book to prevent the dentist or his assistants from receiving more than the new maximum permissible dose.

The chapters on roentgenographic technic are complete and offer a variety of methods that are designed to produce roentgenograms of practically any abnormal oral condition.

The section on roentgenographic indications of growth and development of the teeth and jaws, particularly well done in the third edition, is repeated in the fourth edition.

The authors have recognized that children's teeth develop at widely different rates and that, although chronological tables may be useful as a guide, classifying a child as abnormal because he is ahead or behind the "normal" in terms of chronological age is open to question. It is better to determine a child's age by asking than by predicting from the dental roentgenogram. However, this reviewer disagrees with the statement on page 164 which says, "There is a spacing of the deciduous teeth; this is evidence of normal jaw growth . . ." In light of reports in the current dental literature and the roentgenograms in this book there is, as the child becomes older, a decrease of space between the anterior deciduous teeth rather than an increase.

The discussion of roentgenographic diagnosis of caries is well done, except for the case shown on page 232 where resorption of the crown of a bicuspid was confused with caries. In this instance, the resorption was due to the destruction of the reduced enamel epithelium during surgery or inflammation which allowed connective tissue elements to contact the enamel, a condition which usually results in osteoclastic resorption of the enamel. This carry-over from the third edition could have been omitted from the caries section and placed in the section on abnormal resorption.

The remainder of the book deals with the roentgenographic diagnosis of various oral diseases and conditions.—*William F. Via, Jr.*

■ FRACTURES OF THE FACIAL BONES. By W. Wallace Webster, D.D.S. 145 pages with 107 illustrations. $6.50. Lincoln, Neb., University of Nebraska Press, 1957.

This small book is apparently intended primarily for the use of dentists in general practice who wish a simple source of information on the management of facial injuries, especially during war. It is composed of three major divisions.

Section I is entitled "The Wound and Wounding" and includes a discussion of the various basic types of facial wounds and the repair of soft tissue lacerations in addition to the simple basic principles of operating room conduct. Various simple methods of ligation of vessels and suturing of wounds are included.

Section II is a small section of ten pages and is entitled "First Aid Treatment." This section includes a discussion of hemorrhage control during the immediate emergency state, the means of establishing an adequate airway short of surgical intervention and the use of supporting external bandages. These procedures are adequately illustrated by good drawings.

Section III is entitled "Emergency Treatment," but actually also discusses definitive therapy for fractures of the maxillary, mandibular and facial bones, including late complications. Simple methods of wiring the teeth into normal occlusion are adequately covered by both description and illustrations. Open surgical procedures are also discussed, including direct wiring of the fractured fragments, skeletal fixation and plating. Intraoral splints of various types are also described.

Considered over-all, the book is adequate only for the person desiring rather superficial information about the management of facial injuries. The wisdom of some of the procedures discussed in Section III is open to considerable question, although their inclusion can be justified on the basis of completeness. On the other hand, the discussion of condylar fractures is decidedly inadequate, and although the author apparently feels that there are indications for open operation, they are not listed for the reader.

The illustrations that are used are of good quality throughout, but the book suffers somewhat from a lack of bibliography or index; basically, it is a monograph recording the author's experiences in this field.

■ ANESTHESIA: THIEF OF PAIN. By Sylvan M. Shane. 87 pages with 3 photographs. $2.50. New York, Vantage Press, 1956.

This little book is written by a dentist purportedly to give the patient or patient-to-be a clearer understanding of anesthesia and thus to allay his fears of the impending ordeal. It sets forth in simple language what happens before and during anesthesia both in the hospital and in office practice. As such, this book fills a real need. On the whole it is well written, and some parts of it are delightfully presented, such as the account of the journey of the ether vapor through the body. In other parts the author's approach almost borders on flippancy, such as when he traces the origin of the obstetrician's hemorrhoids and the pinching of nurses.

It is regrettable that a book which could have been such a success should be open to criticisms as serious as those which apply to Dr. Shane's publication. The author should have stated at the beginning that his book presents his own concept of anesthesia only, which is by no means that of all practicing anesthesiologists.

Several times in the book he seems to indicate that a patient with a head cold can be safely anesthetized by any method other than ether. This statement is certainly open to serious question. His description of the induction of anesthesia for a frightened child who is held down by a number of assistants until a needle can be inserted for the injection of thiopental sodium is reminiscent of his description of events before the advent of anesthesia when patients were also forcibly restrained. There are many smoother methods of inducing anesthesia in children, which do not resort to force, for example, rectal medication.

He states that nurse anesthetists "administer all types of general anesthetics under the supervision of an anesthesiologist." This may happen in the author's own institutions, but it certainly does not apply to the large majority of hospitals throughout the country. It would be unfortunate if a lay person reading this book got the idea that he is safe in the hands of a nurse anesthetist because she is supervised by a fully trained specialist.

The greatest criticism the reviewer has of this book is that it refers in several instances to the drug N-propyl methyl ether (Metopryl) which the author introduced in 1945 and which is hardly ever used in anesthesia practice today. This drug has no place whatever in a book of this sort, especially when well accepted agents such as vinyl ether (Vinethene) and trichloroethylene (Trilene, Trimar) are not even mentioned once despite their common use

in both surgical and dental anesthesia practice. Furthermore, the author devotes one entire chapter to balanced anesthesia, but he describes only his own method. He gives no indication whatsoever that there are other types of combined technics, many of which are much more widely practiced than the Shane-Ashman method, which he devised and advocates.

Despite its admitted good points, a book written from such a partial viewpoint cannot be recommended to the type of reader for whom it is destined and who must accept the presentation on its face value.—*G. M. Wyant.*

■ A SYSTEM OF ENDODONTIA FOR THE GENERAL PRACTITIONER. By L. Castagnola and H. G. Orlay. 143 pages with 45 illustrations. London, Pitman Medical Publishing Co., Ltd., 1956.

This book hopes to stimulate the general dental practitioner to treat teeth with involved pulpal tissue by endodontic technics that the authors have found to be efficient.

The first chapter discusses the deplorable state of dental health of the British people and how this could be changed by proper endodontic procedures.

A discussion of instruments and drugs fills the next two chapters. Unfortunately, in chapter 2, the authors express a dangerous opinion regarding safety in the use of dental fluoroscopy equipment. "The Ministry of Health issued a warning announcement against its use (B.D.J., 15 April 1952)," they write, "but this we believe is unjustified and unwarranted, and the opinion that the [fluoroscopy] mirror could be dangerous . . . can be disregarded, arising as it does from gross ignorance of the facts."

When one evaluates the use of dental fluoroscopy equipment using as a guide *Handbook 60, X-ray Protection* (published by the U. S. Department of Commerce), it would seem that the authors of a *System of Endodontia for the General Practitioner* are the ones ignorant of the facts.

Chapter 4 is concerned with the anatomy and physiology of pulp, root canals and cementum. Chapter 5 is concerned with roentgenographic technics as applied to endodontics. A discussion of vital pulp therapy, mortal amputation, root canal treatment, failures and accidents comprise the remainder of the book.

In reviewing this book, one is impressed by the lack of documentation from the current dental literature. The bibliography consists of 22 references, nine of which were written by the authors themselves.

Perhaps one last quotation, illustrating an undocumented statement and the authors' irrational viewpoint, is in order. "Many workers find it necessary to examine the sterility of the canal before filling it. As already stated, at least two such controls are necessary, but the authors' view is that they are unnecessary. They would considerably prolong the time needed for the treatment, and would therefore act as a deterent to systematic treatment of all patients in general practice, especially under the National Health Service."

It is the reviewer's opinion that this book is unsuitable as a guide to proper endodontic technic.—*William F. Via, Jr.*

■ SURGERY OF THE MANDIBLE, by Bernard G. Sarnat, M.D., and Irwin D. Robinson, D.D.S., Plast. & Reconstr. Surg. 17:27 Jan. 1956.

An understanding of normal growth of the mandible provides the basis of early recognition and proper surgical treatment of some deformities. Mandibular growth is the result of an integration of activities in a number of regions. Two types of bone growth occur in the following principal regions: (1) appositional, at all of the free borders, with the exception of the anterior border of the ramus; (2) epiphyseal-like growth at the condyle. There is continuous surface remodeling. Normal development of the mandible is dependent on synchronous coordination of the growth activities of the various centers. Any interference which affects the growth centers will alter the orderly progression of development and will result in some type of mandibular deformity.

Mandibular growth deformities can be classified according to whether the mandible is larger or smaller than normal. Although the deformity is frequently bilaterally symmetrical, unilateral disturbances are not uncommon. It has been established that the condyle is the most important growth center of the mandible. Any disturbance of this region which will decrease the growth activity will result in an underdeveloped mandible. The effects that injury will have on the growing condyle and subsequent deformity of the jaw is determined, not only by the severity and duration of the noxious agent, but also by the particular time of occurrence. The effect will be more marked if the injury occurs early in life when condylar growth activity is greater than later in life when condylar growth activity is considerably decreased, and the mandible has assumed its adult form and size. With a unilateral disturbance, there is usually considerable asymmetry of the mandible with deviation toward the injured side. With a bilateral condylar growth arrest, there is usually a symmetrical lack of growth in the mandible, the so-called bird face.

The causes of underdevelopment of the mandible may be local or systemic. Local causes are trauma and inflammation, ankylosis and condylar resection. Systemic causes are the various hereditary and congenital conditions, including chondrodystrophia foetalis (achondroplasia), mandibular micrognathia (Pierre Robin syndrome), other congenital anomalies, inflammatory lesions such as suppurative arthritis of gonococcal origin, dietary deficiency and endocrine disturbances such as cretinism.

Among the causes for overdevelopment of the mandible are local causes such as an enlarged tongue, intrinsic factors such as mandibular tumors, idiopathic causes such as unilateral hyperplasia of the mandibular condyle or of the mandibular body, prognathism, either caused by hyperpituitarism or of unknown etiology. The surgical treatment for disturbances of mandibular growth and development are discussed briefly and are correlated with the etiologic factor causing the asymmetry. —*Irwin A. Small.*

■ THE USE OF CONTROLLED HYPOTENSION IN OPERATIONS ON THE HEAD AND NECK. Henry P. Roister, M.D., and John W. Ditzler, M.D. Plast. & Reconstr. Surg. 17:9 Jan. 1956.

The value of hypotensive technic in radical head and neck operations can be limited entirely to (1) reduction in loss of blood, especially in the simple and anatomically standardized neck dissection, and (2) facilitation of dissection, an advantage that cannot be recorded statistically. In many instances, dissection of malignant head and neck tumors produces profuse hemorrhage that cannot be controlled by surgical hemostasis with ordinary methods. Under controlled hypotension, bleeding is

greatly reduced, the field is more visible and the patient does not suffer, perhaps fatally, from rapid exsanguination.

A thiophanium derivative (Arfonad) was used, except for one patient, as the ganglionic blocking agent to produce hypotension. It is suggested that this technic for producing hypotension be used only when excessive blood loss is expected, and dissection will be facilitated by a dry field. Complications attributable to this technic of producing hypotension did not occur in this study.—*Myron Kaufman.*

■ ACTINOMYCOSIS: SOME CONCEPTS OF THERAPY AND PROGRESS. A. M. Fisher and J. C. Harvy. Postgrad. Med. 19:32 Jan. 1956.

Despite the fact that strains of actinomyces are highly sensitive to antibiotics, the disease caused by these microorganisms continues to present difficult therapeutic problems. The type of tissue reaction is fairly characteristic and offers the most logical explanation for some of these problems. The involved regions are usually rather extensive, considerably indurated and relatively avascular in the region of the growing organisms. Thus, it is difficult to get a bactericidal concentration of drugs into the region of active infection and to restore the involved tissues. These facts serve to emphasize two general principles in therapy; namely, the necessity of surgical drainage or even excision in many instances and the need for intensive prolonged medical therapy.

One of the characteristics of the infection is the formation of multiple draining fistulas. In many instances, sulfur granules may be demonstrated grossly, making diagnosis more certain. Microscopic examination reveals the round or regular sulfur granules in addition to the reticulum of gram-positive filaments which may have small club-like pseudopods. The lesions of actinomycosis tend to spread mainly by contiguity. As a result, large areas of the skin and subcutaneous tissues frequently are involved. According to Conant and Rosebury, the disease is of the cervicofacial type in more than half the cases which occur in man.

Treatment should include both surgical and medical therapy. Sometimes surgical drainage may be all that is necessary. Penicillin is the antibiotic of choice. It penetrates tissues well, can be given for long periods of time and is bactericidal in action. In extensive lesions, large doses, 3,000,000 to 6,000,000 units per day, should be given for six months or longer.—*Irwin A. Small.*

■ CONTROVERSIAL POINTS IN THE TREATMENT OF PAROTID TUMORS. Donald P. Shedd and Harold S. Fleming. Surgery 40:258 July 1956.

A study was made of 108 malignant and benign tumors of the parotid gland treated during the period 1922 to 1955 at Yale (New Haven) Medical Center. Of these tumors of the parotid gland, 20 were found to be malignant. Of the 20 patients with malignant neoplasms, 12 are either dead or living with uncontrolled tumors.

There is controversy regarding the role of biopsy. Since 80 per cent of the parotid tumors will be of the benign mixed type, the benign character of the tumor may be assumed unless the clinical picture arouses suspicion of malignancy. In such an instance, a cautious preliminary biopsy is in order, with histologic study by immediate frozen section if possible. Should the frozen section prove indeterminate, the small biopsy wound can be closed, and the results of permanent sections awaited.

In instances in which the clinical impression is that of benign mixed tumor, a definite procedure may be carried out without previous biopsy. Because of the fear of damage to the facial nerve, it is recommended that local excision of the tumor from the gland be carried out. However, the mixed tumor may have pseudopods extending out into the gland, a condition which makes local excision inadequate and which probably accounts for the recurrence rate of these tumors. In recent years, there has been a definite trend toward complete excision of the lobe, usually the superficial lobe in which the tumor lies.

The incidence of involvement of cervical lymph nodes from parotid cancer reported in the

literature runs from 25 per cent up. This frequency of involvement means that the extent of operation required for cure is probably total parotidectomy plus radical neck dissection in continuity, with sacrifice of part or all of the facial nerve as determined by the tumor.

If radical neck dissection is accepted as part of the management of malignant parotid tumors, it is probably wise to carry out this procedure at the same time as excision of the parotid gland. For this reason, it is recommended that on completion of the excision of a supposedly benign tumor, the specimen be immediately examined grossly and by frozen section. If a diagnosis of malignancy is reached, radical neck dissection can be carried out in the same operation.

Irradiation therapy did not receive a sufficient trial in the present series to make possible a valid appraisal. Reports from Europe indicate high cure rates in patients with benign mixed tumors treated by combinations of local excision and irradiation.—*Irwin A. Small.*

■ Mandibular Retrusion with Ankylosis of the Temporomandibular Joint. V. H. Kazanjian, D.M.D., M.D. Plast. & Reconstr. Surg. 17:91 Feb. 1956.

Two cases of severe mandibular deformity which originated in childhood are presented. The first involved unilateral underdevelopment of the horizontal and ascending rami. The second deformity was bilateral and was complicated by temporomandibular ankylosis. Surgical efforts were first devoted to re-establishment of jaw function by arthroplasty and sliding osteotomy. Next, contour restoration was accomplished by bone grafting, and finally, intraoral anatomy was made suitable for retention of dentures by skin grafting. The surgical management of each is described in detail, including preoperative preparation of the splint for postoperative control of bony fragments. The advantages of otogenous bone over other transplantable material is discussed, and a method described of avoiding injury to the mandibular nerve when a sliding osteotomy of the mandible must be done.—*Myron Kaufman.*

■ Free Composite Grafts from Lower to Upper Lip. W. S. Flanagin, M.D. Plast. & Reconstr. Sur. 17:376 May 1956.

The standard correction of a flat upper lip in a patient who has had a cleft lip for some time is the full-thickness Abbe flap, switched from lower to upper lip in a two-stage procedure. An experimental technic has been developed which reduces the repair to a one-stage operation, even when the columella must be lengthened. A composite graft comprising skin, mucosa and the full complement of intervening tissue, and measuring up to 1 cm. wide at the mucocutaneous junction, is taken from the center of the lower lip and transferred to the upper lip in a single procedure.

Of the four grafts performed and reported on to date, all survived despite mild superficial necrosis which occurred at some point in all of them. This radical technic is purely experimental surgery, in which the margin of safety between success and failure is narrow.—*James Springer.*

■ The Parotid Gland: An Anatomic Study. Joseph Winsten, M.D., and Grant E. Ward, M.D. Surgery 40:585 Sept. 1956.

The question of whether the parotid gland is unilobar or bilobar and whether the facial nerve courses within the gland substances or occupies a separate tissue plane has never been settled definitely. A knowledge of this anatomy influences the surgical approach to parotid neoplasms. It has long been known that benign mixed tumors of the parotid gland have a higher recurrence rate after what have apparently been total excisions than do other benign neoplasms in the body. This study was carried out to evaluate the possibility that there are peculiarities of this region which interfere with total excision of tumors of the parotid gland.

Unfixed cadaveric heads were used in the study. A low-fusing metal was injected into the duct system of the parotid gland. Roentgenograms were then made of the specimen in the various anatomic positions. Next, the soft tissue

was corroded away by placing the heads in 20 per cent potassium hydroxide. The duct system was then related to the mandible and skull.

This study revealed two main points: The parotid gland is essentially unilobar, and the facial nerve branches are intimately enmeshed within the gland tissue. These anatomic facts disprove the idea that the parotid gland is composed of a large superficial lobe overlying the masseter muscle and the angle of the mandible and a small deep lobe medial to the descending ramus of the mandible and that these two lobes are connected by an isthmus.

It is further demonstrated that in the human embryo the facial nerve appears in the face prior to the development of the parotid gland, and that the gland grows out from the primitive oral cavity, across the masseter muscle, around the ascending ramus of the mandible posteriorly, to lie on the pharynx. At the same time the gland grows between the branches of the nerve. There is no line of cleavage between the gland and the nerve. These anatomic relations must be borne in mind by the surgeon while operating in the region of the parotid gland and the facial nerve.—*Irwin A. Small.*

■ STRESS AS AN ETIOLOGIC FACTOR IN THE DEVELOPMENT OF CLEFT PALATE. Lyon T. Strean, Ph.D., D.D.S., and Lyndon A. Peer, M.D. Plast. & Reconstr. Surg. 18:1 July 1956.

Because stress may play a significant role in the etiology of congenital abnormalities, an investigation was undertaken at the Rehabilitation Center of the Hospital of St. Barnabas, Newark, N. J., where 228 mothers of children with cleft palate or cleft lip were studied. An attempt was made to determine whether any relation existed between their medical history and the incidence of this congenital abnormality. Since the maxillae in the human embryo fuse between the sixtieth and seventieth day of pregnancy, information relating to the eighth, ninth and tenth week of pregnancy was critical to this study.

Replies to a questionnaire indicated that cleft palate and cleft lip were more prevalent in the white children than in the colored, the proportion being 97 to 3. Since emotional stress appears to be an important etiologic factor, the low incidence of cleft palate in Negro children may be explained on the basis of higher frustration tolerance in the Negro population as compared with that of the white pregnant women.

The age of parents did not play a significant role in the development of cleft palate in the offspring. Since the incidence of cleft palate was highest in the first-born and many mothers were fearful of a second pregnancy, the average age of the mothers at the time of pregnancy was relatively low. The high incidence of cleft palate in the first-born may be attributed to the severe anxiety frequently associated with the first pregnancy, coupled with other stressful situations.

Physiologic stress resulting from infections and other forms of disease and traumatic stress occurring between the eighth and eleventh week of pregnancy constituted significant causative factors in this group. Severe emotional stress, particularly when associated with hyperemesis, appears to have been the most important single factor.

Twenty-five per cent of the mothers stated that some member in the family had had a cleft palate or cleft lip. It seems probable that two factors operate in the production of this abnormality; genic activity and stress. It is believed also that the catabolic effect of an abundance of hydrocortisone secreted by the adrenal cortex in response to stress was an important factor in the production of this congenital abnormality. The problem is sufficiently important to warrant further investigation.—*Myron Kaufman.*

Announcements

■ More than 300 United States Dentists to Attend World Congress

More than 300 dentists from the United States will attend the Fédération Dentaire Internationale's Twelfth International Dental Congress September 7-14 in Rome, Italy, announces Obed H. Moen, F.D.I. treasurer from the United States. The U. S. leads all other countries in registration, Dr. Moen states.

Proceedings of the Congress will be translated into five languages by a system of simultaneous translation. Dentists interested in taking part in the scientific program are asked to write Luigi Marziani, chairman of the clinic committee, Via Boezio 16, Rome. An extensive social program is planned. Tours through various European countries are being offered by a number of American organizations. Information on registration and housing may be obtained from Dr. Moen, Masonic Temple, Watertown, Wis.

■ More than 8,000 Dentists World-Wide Read Dental Abstracts

With the addition in the last two months of 1,200 new subscribers to DENTAL ABSTRACTS, total subscriptions to the Association's youngest publication passed the 8,000 mark. The magazine is read in about 65 countries.

Starting with the June issue, DENTAL ABSTRACTS began a new service for its readers. Addresses of the authors of the original articles abstracted will be carried in the magazine when they are available. In instances in which the address is not obtainable, the reader may write the editor of the journal of the original publication for such information. The addresses of editors are published in the annual index to DENTAL ABSTRACTS. This new service will facilitate communication between the readers and authors.

■ A. B. Coxwell Succeeds Ruth Whalen as Secretary of American Society of Oral Surgeons

The executive council of the American Society of Oral Surgeons has appointed A. B. Coxwell of Louisville, Ky., executive secretary to succeed Miss Ruth Whalen. Miss Whalen, whose resignation becomes effective in November, has been named registrar of the School of Dentistry of the Medical College of Virginia. Dr. Coxwell, a graduate of the University of Louisville School of Dentistry, is secretary-treasurer of the Kentucky State Dental Association. The executive offices of the American Society of Oral Surgeons are now at 2208 Dundee Rd., Louisville.

■ New York Court Rules Blue Shield Must Pay Dentists

The New York State Supreme Court has ruled that United Medical Service, Inc., (Blue Shield companies of New York) must pay dentists for oral surgery procedures which they perform under the companies' medical expense indemnity contracts. In so ruling, the high court upheld an earlier decision of New York's former Attorney General Jacob K. Javits.

A 1953 amendment to the state's insurance law expanded the definition of medical expense indemnity to cover "dental care provided through duly licensed dentists," but six of the seven Blue Shield companies had refused payment. In appealing to the state supreme court, they claimed that the insurance commissioner had no right to direct payment and that the amended section of the insurance law was unconstitutional. Both claims were rejected by the court.

■ Housing Bureau Opens for Miami Annual Session; Color TV Clinics are Feature of Scientific Program

Opening May 1 of the American Dental Association's Housing Bureau for the 98th annual session has been announced by Arthur W. Kellner, chairman of the general committee on local arrangements. The annual meeting will be held November 4-7 in Miami and Miami Beach. All reservations must be made through the Housing Bureau, Box 1511, Miami Beach, Fla. Some 40 hotels in this resort area, many of them world known, have pledged accommodations for the dental meeting.

The House of Delegates will meet at the Fontainebleau in Miami Beach. The scientific program will be at the Dinner Key Auditorium in Miami.

A feature of the scientific program will be color television clinics demonstrating operative procedures at Florida's famed Dade County Dental Research Clinic. In ten half-hour clinics, the following procedures will be viewed: cleft palate prosthesis, use of rubber base materials for gold inlays and fixed bridges, gingivectomy, construction of porcelain jacket crowns with high-speed cutting instruments, early detection of cancer, apicoectomy and construction of complete upper and lower dentures.

The color TV program has been made possible by the Smith, Kline and French Laboratories, which have assumed the entire cost of the program.

■ Psychiatry, Research, Caries, Anesthesiology Among Subjects at October Dental Medicine Meeting

Psychiatric problems related to dental practice, research, caries and fluorides, anesthesiology and scientific research in the U.S.S.R. will be discussed at the fourteenth annual meeting of the American Institute of Dental Medicine October 13-17 in Palm Springs, Calif. Announcement of the program was made by Hermann Becks of San Francisco, Calif.

Essayists will be Joseph F. Volker, dean of the School of Dentistry, University of Alabama; Edwin F. Alston, M.D., University of California Medical School; Max S. Sadove, M.D., professor of surgery, University of Illinois; S. J. Kreshover, chief of the intramural research program, National Institute of Dental Research, and K. F. Meyer, M.D., director emeritus of the Hooper Foundation for Medical Research.

Additionally, research reports will be made by three investigators in oral biology, Sol Silverman and Howard Myers of San Francisco and Theodore Grant of Oakland, Calif.

Reservations for the meeting may be made with Miss Marion G. Lewis, executive secretary, American Institute of Dental Medicine, 2240 Channing Way, Berkeley 4, Calif.

■ Choose Committee for Australian Dental Meeting

The executive committee has been named for the next national Australian Dental Congress. The Congress will be held in Adelaide, South Australia, February 23-27, 1959. Serving on the committee are: M. S. Joyner, president-elect; R. S. Blackburn, vice-president; P. M. Wesslink, vice-president; B. W. Leach, treasurer, and M. J. Barrett, secretary. Dentists from the United States interested in the meeting may write to Dr. Barrett, 51 Grenfell St., Adelaide, South Australia.

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